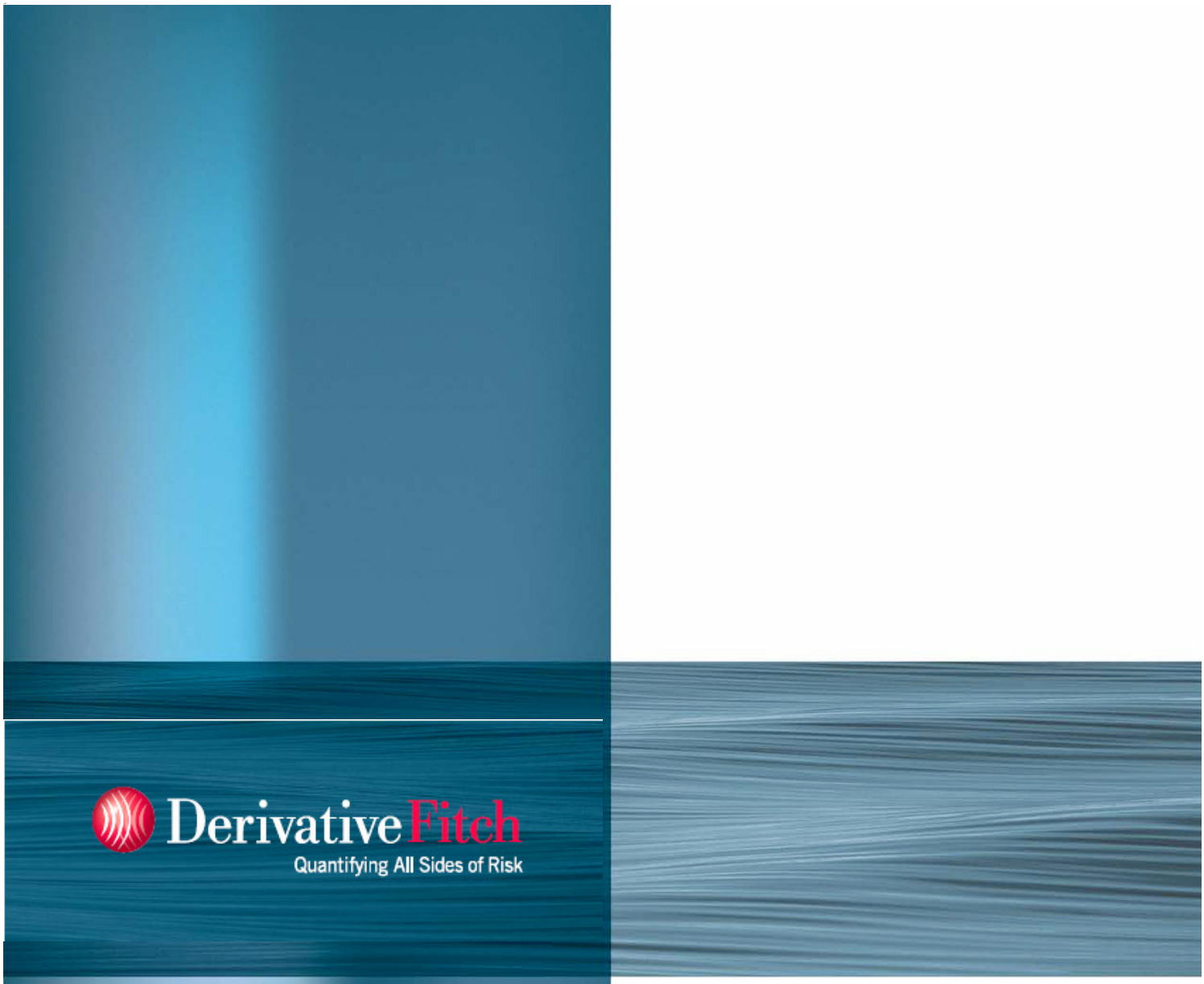


Default VECTOR 3.1 Model User Manual

Table of Contents

Changes from Vector 3.0 to 3.1 3
A. Addition of Single Tier Comparison functionality 3
Changes from Vector 2.2 to Vector 3.0 3
A. Ease of Use 3
B. Recalibrated Assumptions 3
C. Updated Emerging Markets Framework 3
Overview 4
VECTOR 3.1 Definitions 6
A. Reference Obligation Terms 6
B. VECTOR Output Terms 9
C. VECTOR 3.1 Model Short Cuts 9
Deal Setup 10
A. Initial Setup 10
B. Portfolio Setup 11
C. Sample Portfolios 11
D. CDO Squared Setup 11
E. Single tier CDO Comparator set up 13
E. Asset Amortisation Schedule 14
F. Asset Specific Recovery Rates 15
G. Portfolio Properties 16
H. Simulation Run 18
Analytical Results & Summary Reports 19
A. Simulation Summary 19
B. CDO Comparison 21
C. Portfolio Default Distribution 22
D. Portfolio Loss Distribution 23
E. Inner CDO Properties 24
F. Inner CDO Overlap Matrix 24
G. Asset Correlation Matrix 24
VECTOR Assumptions 24
A. Probability of Default 24
B. Recovery Rates 24
C. Correlation Adjustments 24
D. Correlation Factors 24
Reference Entity Feed Set-up and Use 24
A. Download Instructions 24
B. User Instructions 24
Appendix I: Simulation Methodology 24
Appendix II: Pair-Wise Correlation 24
Appendix III: Installation 24
A. System Requirements 24
B. Installation Checklist 24
C. Downloading the VECTOR 3.1 Model 24
D. Installing the VECTOR 3.1 Model 24
E. Reinstalling the VECTOR 3.1 Model 24
F. Opening the VECTOR 3.1 Model 24
G. Uninstalling the VECTOR 3.1 Model 24
Appendix IV: Fitch Industry Mapping 24

Changes from Vector 3.0 to 3.1

A. Addition of Single Tier Comparison functionality

New functionality has been added to allow a Single tier CDO to have assets swapped in and out and the different RLR's calculated and displayed in one simulation run. See 'Deal Set up' section E on page 13.

User option to add notes to all reference obligations cells highlighting basic asset details when hovering over each cell for usability (this is memory intensive).

Changes from Vector 2.2 to Vector 3.0

A. Ease of Use

1. The Reference Entity Feed allows the user to load portfolios with all indicative Vector mappings simply by uploading a portfolio of Name, Ticker, Markit RED code, or Markit RED name, along with par/reference amount:
   - The initial version includes global corporates while later versions will include structured finance securities.
   - The methodology of the Fitch Derived Rating is included for each asset.
2. A new interface, including hot-keys, provides more intuitive navigation and improved productivity.
3. VECTOR now displays the correlation adjustments and factor loadings for the multi factor model.

B. Recalibrated Assumptions

1. The probabilities of default, significance levels and structured finance correlations have been calibrated to better reflect the market.
2. Recovery rate assumptions have been updated to reflect European market development:
   - Senior Unsecured (non-IG) recovery rates lowered.
   - Senior Secured recovery rates increased in some jurisdictions.
   - Junior Secured (Mezz; second lien) recovery rates lowered.

C. Updated Emerging Markets Framework

1. Correlation framework adjusted to highlight risk from region and country (rather than industry basis as in developed world).
2. Sovereign recovery rates updated in line with Sovereign recovery study.

3. Greater granularity and consistency in Recovery Rates for Emerging Market corporate credits.

Overview

The Fitch Default VECTOR 3.1 model (VECTOR 3.1) is Fitch's main quantitative tool to evaluate default risk in credit portfolios referenced by Collateralized Debt Obligations (CDOs). The model can be downloaded from Fitch's website at www.derivativefitch.com This default simulation model analyzes CDO's of corporate assets and asset-backed securities. The output may then serve as an input into the Fitch Cash Flow model.

VECTOR 3.1 simulates defaults through a multi step process. This multi step process allows the portfolio to age in a more realistic manner since the surviving assets face another period of potential default. The determination of default is based on a structural form methodology, which holds that a firm defaults if the value of its assets falls below the value of its liabilities, also referred to as its default threshold.

The main outputs of VECTOR 3.1 are the rating default rate (RDR), rating loss rate (RLR) and the rating recovery rate (RRR) corresponding to each rating level. The rating levels are consistent with a specific portfolio confidence interval. The model outputs also include various portfolio statistics as well as the portfolio's default and loss distribution and the aggregate distribution of defaults over time. VECTOR 3.1 is not a cash flow model and does not take into account structural features such as payment waterfalls or excess spread. The RDR, RRR and timing of defaults are inputs to be used in the cash flow model. For synthetic deals that do not benefit from structural support, the RLR shows the minimum credit enhancement required for each rating.

VECTOR 3.1 allows a look-through analysis for synthetic CDOs of CDOs (CDO squared) portfolios. The model simulates the universe of underlying assets that make up the inner CDOs and computes the loss on the master CDO, taking into account the attachment and detachment points of the individual inner CDO tranches. The correlation and recovery rates on the inner CDOs are simulated based on the individual underlying portfolios and no additional assumptions are required.

The model engine is a C++ compiled program embedded into a Microsoft Excel spreadsheet which serves as the user interface and contains both inputs and outputs.

This manual will begin with instructions for installing VECTOR 3.1. Thereafter it will address the various input sheets required to evaluate a portfolio as well as describe the individual output sheets and data produced by VECTOR 3.1. For a more detailed discussion of the VECTOR outputs and how they are used in Fitch's overall analysis see "*Global Rating Criteria for Collateralised Debt Obligations*", dated October 4, 2006, available on www.fitchratings.com. The manual will conclude with a

description of the model engine and algorithms used to perform the Monte Carlo Simulation.

VECTOR 3.1 Definitions

This section provides brief definitions of many key terms used and seen in the VECTOR 3.1 models.

A. Reference Obligation Terms

Evaluation Date of the CDO (required) – It is either the closing date for new transactions or the date of evaluation for outstanding deals. The user can select the current date from a drop down menu or input a specific date manually in local date format e.g. mm/dd/yyyy format in the US.. The evaluation date is used in conjunction with the Expected Weighted Average Maturity Date to calculate the weighted average life of each asset in a portfolio, as well as determine the simulation horizon. The evaluation date is also used for interpolation of the intra period default. As a result, changing the evaluation date may have a material impact on the results.

Security ID (required) – Must be a unique integer number greater than 0, e.g. CUSIP, ISIN or RED. Securities with the same Issuer ID will be treated as a single obligor.

Issuer ID (required) – This is a non unique alphanumeric string that identifies each issuer. This allows multiple securities from the same issuer to be entered in the portfolio and simulated as a single obligor. For asset-backed securities (ABS), this would include multiple tranches from the same ABS transaction; for corporate entities, various classes of debt from the same company can be entered. For example, if securities 2, 3, and 4 are ABS assets from the same trust, Issuer 2. The rating for each tranche would be entered individually, with the Asset Type description differentiating the seniority of each tranche and the respective recovery rate. In the event of default of a more senior tranche, all of the tranches below it would default automatically. However, a default of a junior tranche does not necessarily have an impact on the more senior tranches. For example, if securities 5, 6, and 7 are corporate debt from the same company, Issuer 3. If a company defaults, there are typically cross default provisions that would cause all of its outstanding debt to default as well, regardless of the seniority or position within the company's capital structure. For multiple issues from the same company, all of the ratings should be that of the company's senior unsecured debt. Upon the company's default, the Asset Type description would dictate the recovery rates for each class of debt. Since VECTOR 3.1 simulates default performance in an annual multi-step process, if there are multiple securities from the same issuer with different maturity dates, VECTOR 3.1 is able to differentiate which bonds are still outstanding at the time of default, and which ones have already matured.

Asset Name (required) – This is a non unique text field that describes the asset.

Asset Class/Tranche (optional) – This field is for reference purposes only.

Asset Type (required) – Describes the nature of the asset (i.e. corporate or ABS) and its ranking in the issuer's capital structure. The Asset Type, in conjunction with the Country, determines the recovery rate for a specific asset. ABS assets are differentiated by seniority and tranche size relative to the capital structure of the issuer.

Country (required) – For corporate debt the country represents the geographical location of the individual company; for multinationals this can be the country where the majority of assets are held. Country, together with Asset Type, determines the applicable Recovery Rate, while Country in conjunction with Industry Class determines the pair-wise asset correlation with other assets in a portfolio. For ABS, the user should select the country based on the regional distribution of the assets. For example, for an RMBS bond linked to a portfolio of German mortgage loans, this would be Germany. ABS linked to multinational portfolios could be classified according to the largest regional concentration within the underlying portfolio. VECTOR 3.1 accepts most countries worldwide. If a particular country is not available under VECTOR 3.1, the user may want to use one with similar jurisdictional and market characteristics in consultation with a Fitch analyst. For Cash securities, it is not necessary to specify a country.

Recovery Rate Multiplier (optional) – May be used to adjust base recovery rates. For example, to reduce the base recovery rate for a specific asset by 20% the user should input 80%. If this field is left blank, the default value will be 100%. Adjustments are typically done on a case-by-case basis and should only be made in consultation with a Fitch analyst to ensure the model accurately reflects agency assumptions.

Asset Par Value (required) – Represents the notional or par value of each asset at closing. For synthetic CDOs the asset par value represents the reference notional of each of the underlying obligors. For synthetic CDO squared structures this field is used to specify the reference notional of stand alone assets referenced by the Master CDO. (For more details on how to use the Asset par Value for synthetic CDO squared please see Underlying CDOs below).

Expected Weighted Average Maturity Date (required) – For assets with a bullet maturity, it is the final maturity date. For amortizing assets, the user may enter the date corresponding to the weighted average life of an asset as measured from the CDO evaluation date. The asset is only modelled up to the expected weighted average maturity date. Alternatively, users have the option of entering the amortization schedule. For Cash securities, it is not necessary to specify a maturity date. For revolving portfolios, Fitch would extend the Expected Weighted Average Maturity Date of each asset for the duration of the revolving period. For more detail on the treatment of revolving portfolios see "*Global Rating Criteria for Collateralised Debt Obligations*", dated October 4, 2006, available on www.fitchratings.com.

Fitch Rating (required) – This is the Fitch rating of the asset as of the valuation date. For corporate entities, the rating should be the Issuer Default Rating (IDR) of

the company. For treatment of non-Fitch rated assets see "*Global Rating Criteria for Collateralised Debt Obligations*", dated October 4, 2006, available on www.fitchratings.com. For Cash securities, VECTOR 3.1 assumes a 0% default probability. For securities rated 'D', VECTOR 3.1 will assume a 100% default probability and that asset will default in the first period of the simulation.

Default Probability Multiplier (optional) – May be used to adjust a default probability assumed by Fitch. For example, to increase the default probability for a specific asset by a net 20%, the user should input 120%. If this field is left blank the default value will be 100%. Note that any adjustment will alter the default term structure of this asset; adjustments are typically done on a case-by-case basis and should only be made in consultation with a Fitch analyst to ensure the model accurately reflects agency assumptions.

Rating Watch (required) – If this field is Negative, the rating of the asset is lowered by one sub-category and vice versa if the field is Positive.

Restructuring / **Obligation Acceleration** (optional) – These fields apply to synthetic transactions only, for which Restructuring and Obligation Acceleration can be selected as Credit Events under the International Swaps and Derivatives Association (ISDA) definitions. Neither event is captured in Fitch's study of historical default rates, which was used to derive the CDO Default Matrix. Therefore Fitch adjusts the Default Rates for those assets for which either one or both of these events are applicable. The adjustment depends on the rating and recovery rate of each asset. Calculate Portfolio Statistics automatically calculates the adjustment for each asset, which is displayed in the column labelled 'Credit Event Adjustment'. No adjustment will be applied if these fields are left blank. Any additional Default Probability multiplier will be applied on top of the Credit Events adjustment. For example if the user enters a default probability multiplier of 110% and the Credit Event adjustment is 105% the final adjustment applied to the default probability is 110%*105%=115.5%.

Fitch Industry (required) – For corporate entities, this represents the business sector of an underlying obligor. For diversified companies the applicable industry class should be derived from the Industry accounting for the majority of the company's revenues. The industry, together with the Country classification, determines the correlation of an asset with all other assets in a portfolio applied by the model. The user can select one of 25 corporate Industry sectors. To standardise the Industry classification and to simplify the process, especially for large portfolios, Fitch has mapped its 25 corporate Industry classes to Dow Jones' global classification standard, as shown in Appendix IV. This enables the user to select the applicable Fitch Industry class based on the asset's Dow Jones industry code (if available).

For ABS sectors, the user can select from six major ABS sectors, each with various subsectors. The major sector must first be selected from the pull down menu; the pull down menu in the next column will then refer to the applicable ABS sub-sectors. For Cash, the industry None should be selected.

User Defined Region / **User Defined Sector** (optional) – These are used for the User Defined Correlation option. The user can group assets into one of six custom regions and six custom sectors.

Amortization (optional) – The user can select to model individual assets as having bullet maturity dates (select No) or as amortising assets using the amortisation schedule (select Yes For more details on how to model amortising assets see page 12.

Asset-specific Recovery Rates (optional) – The user can select unique "tiers of recovery rates" that are applied in the determination of each scenario Loss Distribution.

B. VECTOR Output Terms

Rating Loss Rate (RLR) – shows the portfolio loss for the particular credit portfolio in the respective rating scenario, taking into account Fitch's recovery rate assumptions for each asset (see "*Global Rating Criteria for Collateralised Debt Obligations*", dated October 4, 2006,, available on www.fitchratings.com). The RLR is gross of any structural mitigants such as excess spread and is derived from the portfolio loss distribution in the same way as the RDR. In the absence of structural support, the subordination has to cover the RLR for the respective rating.

Rating Recovery Rate (RRR) – The RRR shows the expected weighted average recovery rate for a particular credit portfolio in the respective rating scenario on a post-simulation basis. The RRR, as opposed to the weighted average portfolio recovery rate, captures the effect of barbelling between recovery rates on the one hand and rating and term on the other. For example, as the assets with the lower rating also generally have the lower recovery rate, the simple portfolio weighted average recovery rate would most likely overestimate the actual recovery rate of defaulted assets. Fitch generates the RRR from tiered recovery rates for each liability rating.

Rating Default Rate (RDR) – The RDR shows the expected weighted average default rate for a particular credit portfolio in the respective rating scenario on a post-simulation basis. The RLR is gross of any structural mitigants such as excess spread and is derived from the portfolio default distribution. It is the required default hurdle input into Fitch's cash flow modelling and break even analysis (see "*Global CDO Rating Criteria*", dated September 13, 2004, available on www.fitchratings.com for additional details of its calculation and use).

C. VECTOR 3.1 Model Short Cuts

- Calculate portfolio statistics CTRL+SHIFT+A
- Run Simulation CTRL+SHIFT+D

Deal Setup

A. Initial Setup

The Default VECTOR Model is embedded in a Microsoft Excel spreadsheet, which provides the user interface and contains the model inputs and outputs. In order to set up a new deal, both the Main tab and the Reference Obligations tab must be properly configured.

1. **Choose CDO type** – Under Type Analysis, select one of Single-Tier CDO, Look-through CDO-Square or Single Tier CDO Comparator. Any CDO with the analysis of inner CDO must use Look-through CDO-Square analysis.

2. **Select the appropriate CDO Squared Options if applicable**

    a. **Cross Subordination**: Select the first check box if the CDO under analysis utilizes cross subordination.

    b. **Analyze Inner CDOs**: If this function is selected the model can produce the rating loss rates for up to 10 CDO portfolios per model run. The results are shown on the Inner CDO Properties tab. This function is primarily intended for synthetic CDOs of CDOs but may also be used for analyzing traditional CDO portfolios.

3. **Choose the Correlation Type –** There are three choices for correlation:

    a. **Sector Correlation:** This will create a portfolio-specific asset correlation matrix based on Fitch's assumptions. The correlation coefficient for each pair of assets is based on their Country and Industry classification.

    b. **Pair-wise Correlation (PCL):** This functionality allows you to override Fitch criteria with a single pair-wise correlation for all assets.

    c. **User Defined Correlation:** This option allows the user to assign individual correlation assumptions to groups of assets in the portfolio and provides greater flexibility than the single pair-wise correlation option. By selecting this option the user can allocate each asset on the Reference Obligations worksheet to one of six user-defined regions and one of six user-defined sectors. The global correlation levels will be used between assets from different sectors and regions. For assets that are either in the same region or in the same sector or both, the respective sector and region premium will be added to the global base correlation.

B. Portfolio Setup

The Reference Obligations sheet contains details for each asset included in a CDO portfolio. The portfolio can be input in one of three ways:

a. Load a Portfolio: Select the Portfolio dropdown and choose Load Portfolio.

b. Manually enter the appropriate fields for each asset in the portfolio. Please refer to the Definitions section for a detailed description of the usage and required values in each field.

c. Use the Vector data feeder to input tickers or RED's. The data feeder will automatically generate the required inputs that can be copied in the appropriate fields.

C. Sample Portfolios

There are four sample portfolios available for the users' reference in setting up their transactions. These portfolios can be found in C:\Fitch\Sample Portfolios. All four portfolios are representative of asset types often found in these types of transactions.

a. Corporate – This is the CDX NY series 6 portfolio with the appropriate VECTOR inputs.
b. Cash Structured Finance – This is a portfolio of structured finance assets with annual amortization schedules.
c. Synthetic Structured Finance – This is a portfolio of synthetic structured finance assets where the maturities are bullets.
d. CDO Squared – This transaction demonstrates the set up of a CDO squared transaction.

D. CDO Squared Setup

VECTOR 3.1 allows a look through analysis for synthetic CDOs of CDOs (CDO squared) portfolios. The maximum number of underlying CDOs in VECTOR 3.1 is 50. The model simulates the universe of underlying assets that make up the inner CDOs and computes the loss on the master CDO, taking into account the attachment and detachment points of the individual inner CDO tranches.

The inputs that are required to run the look through analysis are:

1. The attachment and detachment point for each of the inner CDO tranches (as a % of the corresponding reference portfolio), which define the individual inner

CDO tranches. (for more information see “Analysing Synthetic CDOs of CDOs” available on www.fitchratings.com).

2. The maturity date of each inner CDO.
3. The universe of assets that are referenced by the underlying CDOs or the Master CDO. Typically the underlying CDOs in a CDO squared structure only reference corporate assets. However, VECTOR 3.1 is able to model ABS assets both in the underlying CDOs as well as in the master CDO. The information required for the assets in the universe are the same as for a standard CDO including items 2, 3, 4, 6, 7, 9, 10, 11 and 15 from the list above. Asset Par Value and Expected Weighted Average Maturity Date (WAMD) represent the par value and WAMD of assets referenced by the master CDO. The asset par value should be zero for assets that are only referenced by the inner CDOs and not the master CDO.
4. The reference portfolio for each of the inner CDOs, by specifying the reference notional for each asset in the universe. Each of the columns V to AY on the Reference Obligations sheet represents one inner CDO tranche and its corresponding reference portfolio. For assets in the universe that are not referenced by the particular CDO portfolio, the reference notional should be zero.

How to model two or more tranches from the same inner CDO with different AP/DP:

Tranches from the same portfolio with different APs and/or DPs can be modelled by copying the same reference portfolio into each tranche column. The aggregated portfolio loss in each of the simulation scenarios will be the same, but the tranche losses can be different due to different APs and/or DPs.

How to model assets that are referenced by both the master CDO as well as some of the inner CDOs:

Each row on the Reference Obligations sheet represents a particular issuer. VECTOR 3.1 allows the user to enter the master CDO reference notional under Asset Par Value and the reference notional for each of the inner CDOs in the same row. A default of that particular issuer would increase the loss on both the master CDO as well as each inner CDO that references this issuer.

How to model senior and sub-debt from the same issuer:

This can be done in the same way as for standard CDOs, by using the Issuer ID and Security ID function in VECTOR 3.1. The user should enter two assets in separate rows with the same characteristics (i.e. country, rating and industry etc.) but specify one as senior and the other subordinated. The issuer ID should be the same for both assets (100% asset correlation). These two assets can be referenced by the inner CDOs. For example if one of the inner CDOs only references the senior debt of that issuer the user should enter the reference notional in the appropriate row and column and set the reference notional corresponding to the subordinated debt to zero.

E. Single tier CDO Comparator set up

1. Load the Single Tier portfolio you wish to analyse changes against through 'Portfolio' 'Load portfolio' menu option.
2. On the 'main' tab select 'Single Tier CDO Comparator' (note once this is selected you will not be able to deselect it without clearing the portfolio first – this is to avoid inadvertent loss of data).
3. The 'reference obligations' sheet opens up to the right hand side
4. The first CDO 1 column (Excel column AE) is your 'reference' portfolio that you loaded and cannot be edited
5. At the top of column E is a check box 'Show Asset Details for every CDO'. If this box is checked every cell has a comments field attached to it so that the asset details from the left hand side of the sheet can be seen at a glance by hovering over the cell. Please note that this can be slow to populate on less powerful PCs.
6. Each column for each change to the CDO has a notes field that can be used to note the purpose for that CDO comparison (i.e. remind you of the changes made to that column/version.)
7. Above each column is a button that allows you to copy the contents of any other CDO column/version into that column to act as a starting point.
8. By right clicking on the mouse while in a selectable cell (for CDO1 this is only the cells above the column heading, for all other CDOs it is any cell under the header or the cells above the header) you are given the option to copy that CDO asset details to any of the other CDO variations.
9. You can then add or remove or change the value of any asset in that 'version' of the CDO.
10. You may also set or change the maturity date for any CDO column/version.
11. Up to 50 different combinations of assets can be loaded but only (any specified) 10 will be compared on a single simulation run.
12. Once all variations of the CDO have been populated populate the 'Select CDO's for Comparison' list on the 'main' sheet with the (up to 10) CDO's you wish to compare (note remove any CDO versions that are not populated from this list to avoid an error).
13. Once the simulation is run the results for the RLR's for each CDO version will be displayed on the 'CDO Comparison' worksheet (see below)
14. Note that you can use the button at the top of each CDO column to save that individual version of the CDO as a normal Single tier CDO portfolio file.
15. A check box at the top of column I allows the highest and lowest values for RLR to be highlighted.

E. Asset Amortisation Schedule

VECTOR 3.1 is a multi-period model using annual holding periods. For example, for a five year asset the model would simulate the asset value of the corresponding obligor for each of the five years.

The user can choose to model the portfolio based on the specific Expected Weighted Average Maturity Date of each asset (select No under Amortisation on the Reference Obligations worksheet), in which case each asset is treated as a bullet maturity. If the asset defaults prior to its Expected Weighted Average Maturity Date, the model records the initial par value at closing as the default amount.

Alternatively the user can select Yes under Amortisation on the Reference Obligations worksheet and input an amortisation schedule, showing the asset's notional at the beginning of each year for years one to 30 (see example)[1]. If the asset defaults, the model will record the outstanding notional amount of the asset in the year of default.

1	2	3	4	5	6	7	8	9	10
10,000	9,500	9,000	8,000	7,000	6,500	5,500	4,500	3,000	0

In this example, VECTOR 3.1 would register a default in year five with a defaulting amount of 7,000 rather than the initial notional of 10,000.

Note: For revolving portfolios, Fitch treats amortising assets as bullets for the duration of the reinvestment period. Assuming a five-year reinvestment period in the above example, Fitch may model the asset using the following amortisation schedule.

1	2	3	4	5	6	7	8	9	10
10,000	10,000	10,000	10,000	10,000	9,500	9,000	8,000	7,000	6,500

[1] Note that this function is only available for the master CDO portfolio in a synthetic CDO squared structure and not for the inner CDOs.

F. Asset Specific Recovery Rates

VECTOR 3.1 induces correlation between recovery values for defaulted assets dependent upon the level of average default rates. This conditional recovery rate calculation means that the underlying default distribution needs to construct a different loss distribution for each region of the default distribution.

Reviewing the simulation summary table below it is clear that the recovery rates change as we move down the capital structure of the default distribution. The correlation between these variables is very strong. This is an important difference between Vector and other credit models.[2] This means that the realized simulation loss rate is always greater than the default rate times severity or loss given default. [RLR > RDR * (1 – RRR)]

Rating	Rating Default Rate	Rating Recovery Rate	Rating Loss Rate
	RDR	RRR	RLR
AAA	38.78%	34.39%	25.14%
AA+	37.76%	36.54%	23.88%
AA	36.73%	36.54%	23.40%
AA-	36.73%	36.54%	22.96%
A+	34.69%	38.69%	21.34%

Linear Correlation among RDR, RRR, RLR

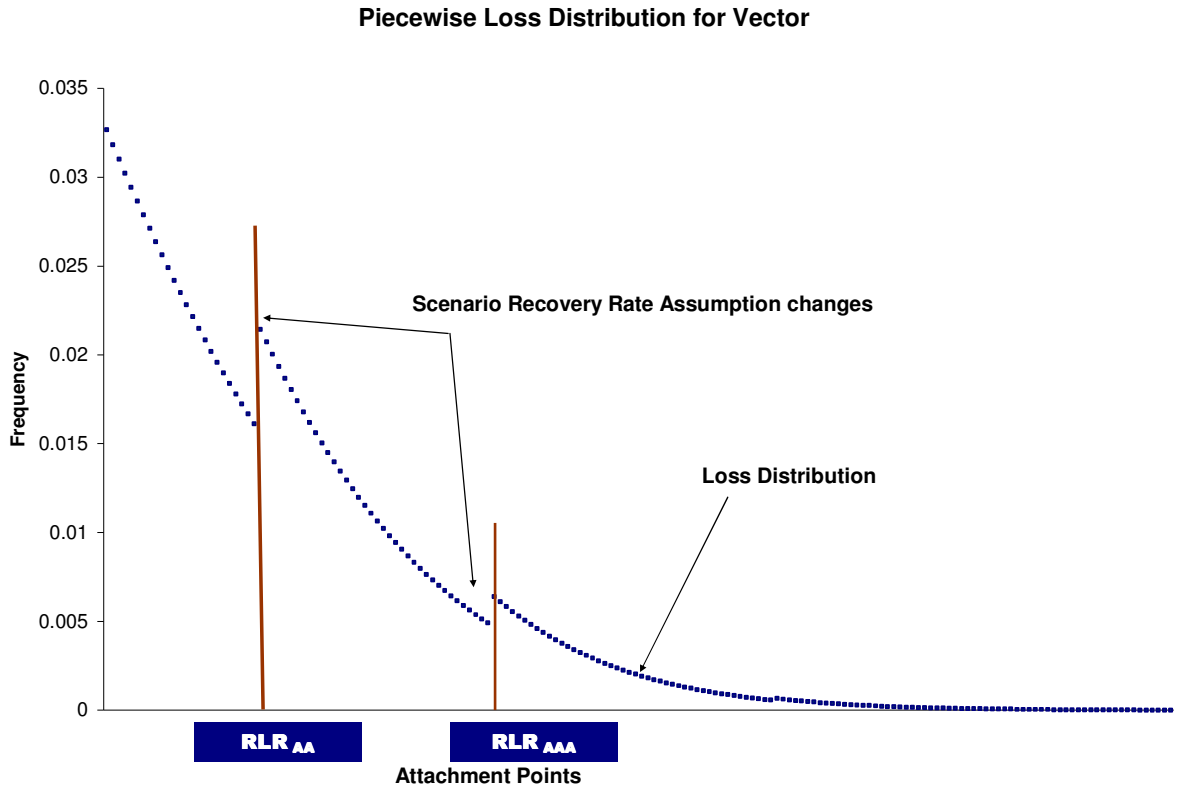
	RDR	*RRR*	*RLR*
RDR	1		
RRR	-0.964	1	
RLR	0.997	-0.978	1

The table below shows the values contained in the new Asset-specific Recovery Rate worksheet. These values are either the values used within Vector to calculate the appropriate recovery rates for each asset for each stress scenario or the values manually specified by the user before running the analysis. If the value “Asset-Specific RR” is ‘blank’ or ‘No’ then this table displays the assumed recovery rate values used by Vector. If the field found in the Reference Obligation worksheet is ‘Yes’ then Vector will use the values entered here to define recovery rates for each scenario. If no values are entered in this sheet the assumed recovery rate values used by Vector will be displayed.

Asset Name	Expect WA Maturity Date	Asset-Specific RR	AAA	AA+	AA	AA-	A+
Abitibi-Consolidated Inc.	12/20/2010		0.20	0.21	0.21	0.21	0.23
Advanced Micro Devices, Inc.	12/20/2010		0.36	0.38	0.38	0.38	0.41
AES Corporation (The)	12/20/2010		0.36	0.38	0.38	0.38	0.41
AK Steel Corporation	12/20/2010		0.36	0.38	0.38	0.38	0.41

[2] Other credit models usually assume recovery rate values are independent of the default rate. This conditional independence is true whether recovery rates are fixed or stochastic.

Internally Vector simulates a default distribution for the portfolio of reference obligations, nevertheless the model will use a recovery rate value for each asset that is conditional upon the default rate at each point of the default distribution. The loss distribution table is actually constructed in a piecewise fashion by changing the recovery rate assumption for the losses observed at that point in the tail. For example the AAA loss rate indicated in the figure below as RLR_{AAA} uses the "AAA" recovery rate assumption for each asset that has defaulted in the portfolio.



G. Portfolio Properties

Once the portfolio has been entered, the user can verify the inputs by selecting Calculate Portfolio Statistics from the Calculations drop down (Ctrl-Shift-A). The model will highlight any invalid inputs and provide an option for each via a drop down menu. The user needs to ensure that all inputs correspond to the format required prior to running the simulation. Selecting the Calculate Portfolio Statistics drop down will calculate the portfolio statistics and the following portfolio properties:

VECTOR 3.1 computes a number of average statistics for the CDO portfolio.

1. The Portfolio Notional Amount is the sum of the par value of all assets in the CDO portfolio. For synthetic CDOs of CDOs, the Portfolio Notional Amount shows the notional of the master CDO portfolio including all stand alone assets as well as the notional of each of the inner CDO tranches. If an asset is referenced in multiple inner CDO's, its value will be appropriately tallied when the notional of the inner CDO is calculated.

2. The Initial Portfolio WAL is the average of the weighted average lives of all assets in the CDO weighted by the assets' par value (excluding Cash). The weighted average life of each asset is calculated as the time from the CDO evaluation date to its Expected Weighted Average Maturity Date using a 30/360 day-count convention. If Amortisation is set to Yes, the assets initial WAL is calculated on the amortisation schedule of the asset.
3. The Initial Portfolio Max Life is equal to the remaining life of the longest-dated asset in the portfolio.

For synthetic CDOs of CDOs, the initial portfolio WAL, as well as the Initial Portfolio Max Life, is calculated for the master CDO and incorporates the term of each of the inner CDO tranches specified on the portfolio definition worksheet.

1. The weighted average rating (WAR) of a portfolio is based on the numerical Fitch Factor corresponding to each asset's rating weighted by its par value. A portfolio WAR is then determined as the rating corresponding to a portfolio's weighted average Fitch Factor (excluding Cash). For synthetic CDOs of CDOs, the WAR is computed for the master CDO portfolio excluding the inner CDO tranches (for which the rating is unknown). If the master only includes CDO tranches the WAR will display Cash. It must be noted, however, that since this statistic is only an average, it does not fully describe the distribution of ratings in the portfolio.
2. The Portfolio Correlation Level (PCL) represents the average of the pair-wise correlation coefficients in the specific portfolio correlation matrix. For synthetic CDOs of CDOs, the PCL is calculated for the universe of underlying corporate entities and ABS assets and NOT for the master CDO portfolio. It must be noted, however, that since this statistic is only an average, it does not fully describe the diversity of pair-wise correlations between the assets.

H. Simulation Run

On the Main page the user to is allowed to specify the number of stress scenarios used in the Monte-Carlo simulation. Generally, the higher the number of simulations, the more accurate the results will be. The minimum number of trials depends on, among other things, portfolio size, rating distribution within the portfolio, and the desired percentile on the output side (the higher the percentile, the higher the minimum number of simulations required). Fitch recommends running a minimum 50,000 trials for an approximation of the RDR/RLR and at least 150,000 for finer precision.

For synthetic CDOs of CDOs Fitch recommends to run a minimum of 200,000 simulations at the master level due to the increased complexity of these structures.

Either select the Run Simulation button or choose Run from the Calculations drop down menu.

The simulation includes a visual timer that will display the progress of the simulation.

Note: During the simulation it will not be possible to amend inputs in any Excel application running.

The time to complete the simulation will depend on, among others, the number of simulation runs, the simulation horizon, and the number of assets in the portfolio and computer hardware. As a guide, for a portfolio of 100 assets, a 10 year simulation horizon and 150,000 simulation runs, the simulation takes between two and three minutes. Simulation speed can be improved by:

a. Shutting down all other applications.
b. Running the model on a stand alone work station.
c. Using a computer with a 2GHz processor or higher.

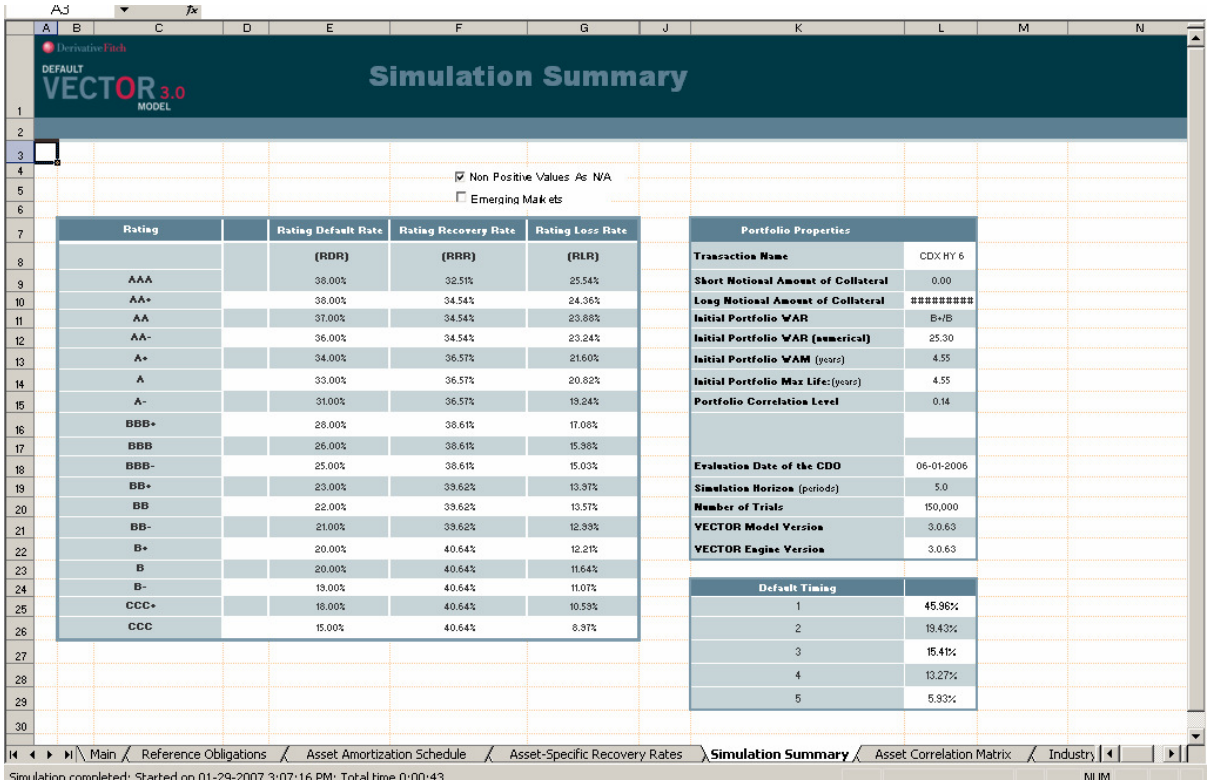
Once the simulation is complete, the application will automatically take the user to Simulation Summary page.

Analytical Results & Summary Reports

A. Simulation Summary

The Simulation Summary shows the version of the Vector model used and all of the results of the analysis, the main output of which are the rating default rate (RDR), the rating recovery rate (RRR), the rating loss rate (RLR) and the default timing. The Simulation Summary worksheet shows the RDR, RRR and RLR for each rating scenario. The RDR, RLR and RRR are derived as the percentile of the respective distribution, corresponding to the default rate implied by the rating scenario and term.

The percentile applied for a particular target rating incorporates the fact that the values in the Default Matrix are based on average default probabilities. If no value directly matches a given percentile, then the value that is equal to or greater than that corresponding percentile is taken. For example, in the chart above the 99th percentile corresponds to a default rate of 41.8%.


DerivativeFitch
DEFAULT VECTOR 3.0 MODEL
Simulation Summary
Non Positive Values As N/A
Emerging Markets
Rating | Rating Default Rate (RDR) | Rating Recovery Rate (RRR) | Rating Loss Rate (RLR)
AAA 38.00% 32.51% 25.54%
AA+ 38.00% 34.54% 24.36%
AA 37.00% 34.54% 23.88%
AA- 36.00% 34.54% 23.24%
A+ 34.00% 36.57% 21.60%
A 33.00% 36.57% 20.82%
A- 31.00% 36.57% 19.24%
BBB+ 28.00% 38.61% 17.08%
BBB 26.00% 38.61% 15.38%
BBB- 25.00% 38.61% 15.03%
BB+ 23.00% 39.62% 13.97%
BB 22.00% 39.62% 13.57%
BB- 21.00% 39.62% 12.39%
B+ 20.00% 40.64% 12.21%
B 20.00% 40.64% 11.64%
B- 19.00% 40.64% 11.07%
CCC+ 18.00% 40.64% 10.59%
CCC 15.00% 40.64% 8.37%
Portfolio Properties
Transaction Name CDX HY 6
Short Notional Amount of Collateral 0.00
Long Notional Amount of Collateral ##########
Initial Portfolio WAR B+/B
Initial Portfolio WAR (numerical) 25.30
Initial Portfolio WAM (years) 4.55
Initial Portfolio Max Life (years) 4.55
Portfolio Correlation Level 0.14
Evaluation Date of the CDO 06-01-2006
Simulation Horizon (periods) 5.0
Number of Trials 150,000
VECTOR Model Version 3.0.63
VECTOR Engine Version 3.0.63
Default Timing
1 45.96%
2 19.43%
3 15.41%
4 13.27%
5 5.93%
Main | Reference Obligations | Asset Amortization Schedule | Asset-Specific Recovery Rates | Simulation Summary | Asset Correlation Matrix | Industry

Rating Recovery Rate (RRR) – The RRR shows the expected weighted average recovery rate for a particular credit portfolio in the respective rating scenario on a post-simulation basis. The RRR, as opposed to the weighted average portfolio recovery rate, captures the effect of barbelling between recovery rates on the one

hand and rating and term on the other. For example, as the assets with the lower rating also generally have the lower recovery rate, the simple portfolio weighted average recovery rate would most likely overestimate the actual recovery rate of defaulted assets.

In the Monte Carlo simulation, each time an asset defaults, its recovery rate in each stress scenario is recorded (Fitch applies tiered recovery rates by rating scenario). VECTOR 3.1 computes the weighted average recovery rate of all defaulted assets in each simulation run which make up the distribution of portfolio recovery rate. The RRR is derived in a similar way as the RDR based on the percentile corresponding to the rating scenario and term.

Note: For synthetic CDOs of CDOs the RDRs and RRR on this worksheet are for the master CDO portfolio.

Rating Loss Rate (RLR) – Shows the portfolio loss for the particular credit portfolio in the respective rating scenario, taking into account Fitch's recovery rate assumptions for each asset (see "*Global Rating Criteria for Collateralised Debt Obligations*", dated October 4, 2006, available on www.fitchratings.com). The RLR is gross of any structural mitigants such as excess spread and is derived from the portfolio loss distribution in the same way as the RDR. In the absence of structural support, the subordination has to cover the RLR for the respective rating.

For synthetic CDOs of CDOs the RLRs on this worksheet are for the master CDO portfolio and provide an indication of the minimum attachment point for the CDO squared structure for a given rating.

Default Timing – Represents the aggregate default allocation over time for all simulation paths. The number of defaults in each year are combined across all simulation paths and divided by the total defaults (across periods and simulation runs). The timing distribution will be used by Fitch as the base case default timing in the cash flow model.

For example, the profile above shows that 15.38% of the defaults occurred in year 3. However, this does not mean that every single scenario had the same default distribution over time, but rather that it provides an indication as to the propensity of default for a specific portfolio.

Industry/ Country/ Rating/ WAL Distribution – Following the Simulation Summary tab, four worksheets contain portfolio statistics including Industry and Country concentrations, rating distribution and distribution of weighted average life for the CDO portfolio[1]. For example, the Industry distribution shows the percentage of par value attributed to a particular Industry.

[1] For synthetic CDOs of CDOs the distributions are computed for the master CDO only. The inner CDOs are taking into account for the WAL and Industry Distribution but excluded for the Country and Rating distribution. In order to compute the distribution for any of the underlying CDOs the user can simply copy and paste the reference notional into the column <Asset Par Value> on the Reference Obligations sheet and Calculate Portfolio Properties.

The user can save all of the VECTOR 3.1 Outputs by selecting Save Reports from the Reports drop down and specifying a file name and location.

B. CDO Comparison

When using the Single tier CDO Comparator after simulation is run this sheet is populated instead of the Simulation Summary sheet. Several of the other worksheets/reports below are no longer available as they would only relate to a single version of the CDO and therefore not applicable.

This sheet show the comparative RLR's for each version of the CDO as below. The lowest RLR's are highlighted in green and the highest in RED.

C. Portfolio Default Distribution

The portfolio default distribution shows the frequency of a particular portfolio default rate in a simulation. As the actual distribution may be too large for some portfolios, the model separates the results into a number of bins.

The following example shows how the portfolio default distribution is generated in the VECTOR 3.1 model. For the purpose of illustration, we assume the hypothetical portfolio comprises only three bonds that are modelled in six independent simulation runs. For each, the model computes the total defaulted asset notional.

	Notional
Bond 1	5,000
Bond 2	3,300
Bond 3	7,000

	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
Bond 1	1	1			1	1
Bond 2			1	1		1
Bond 3			1		1	1

Default	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
Bond 1	5,000	5,000	0	0	5,000	5,000
Bond 2	0	0	3,300	3,300	0	3,300
Bond 3	0	0	7,000	0	7,000	7,000
Default Rate	5,000	5,000	10,300	3,300	12,000	15,300

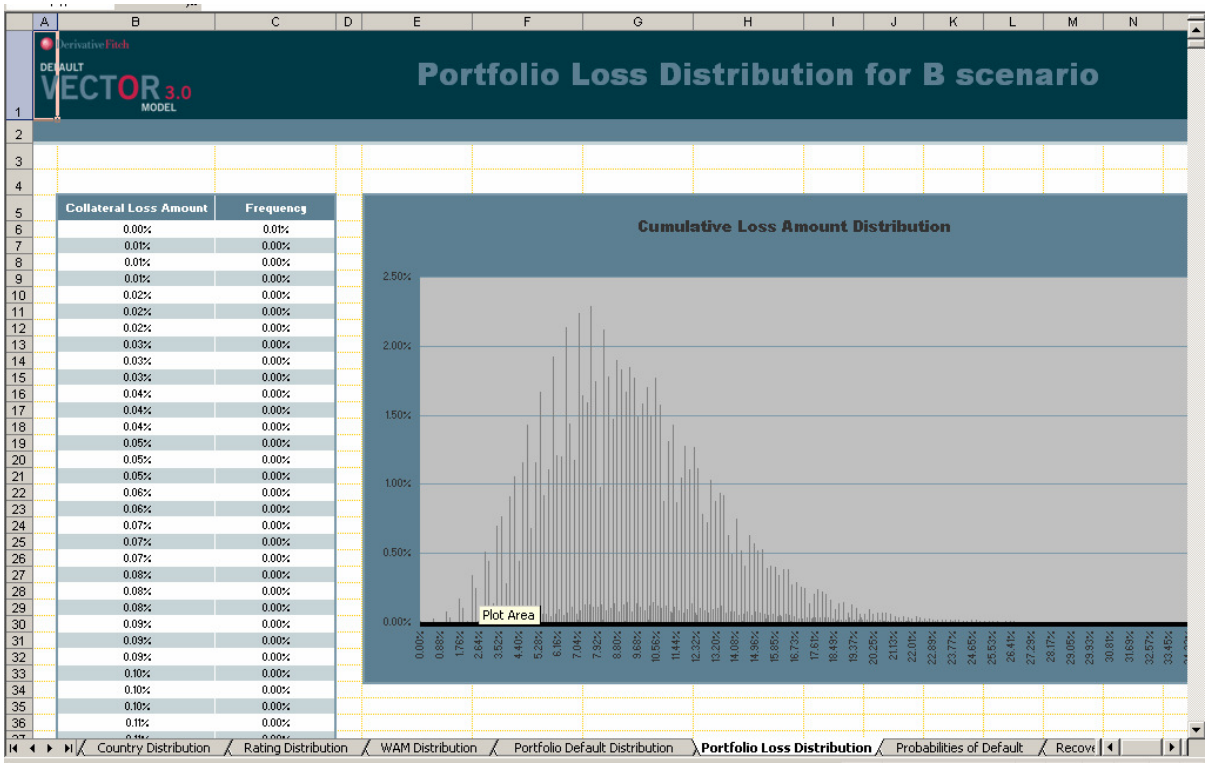
The results of all the simulation paths are then sorted according to the portfolio default amount and the occurrence of each value is counted. In this particular example, path one and two yield the same results.

	Default	#
Path 4	3,300	1
Paths 1,2	5,000	2
Path 3	10,300	1
Path 5	12,000	1
Path 6	15,300	1

The absolute portfolio default amounts are expressed as a percentage of the initial portfolio amount to yield the portfolio default rates. The frequency of defaults is expressed as a percentage of the simulations run.

D. Portfolio Loss Distribution

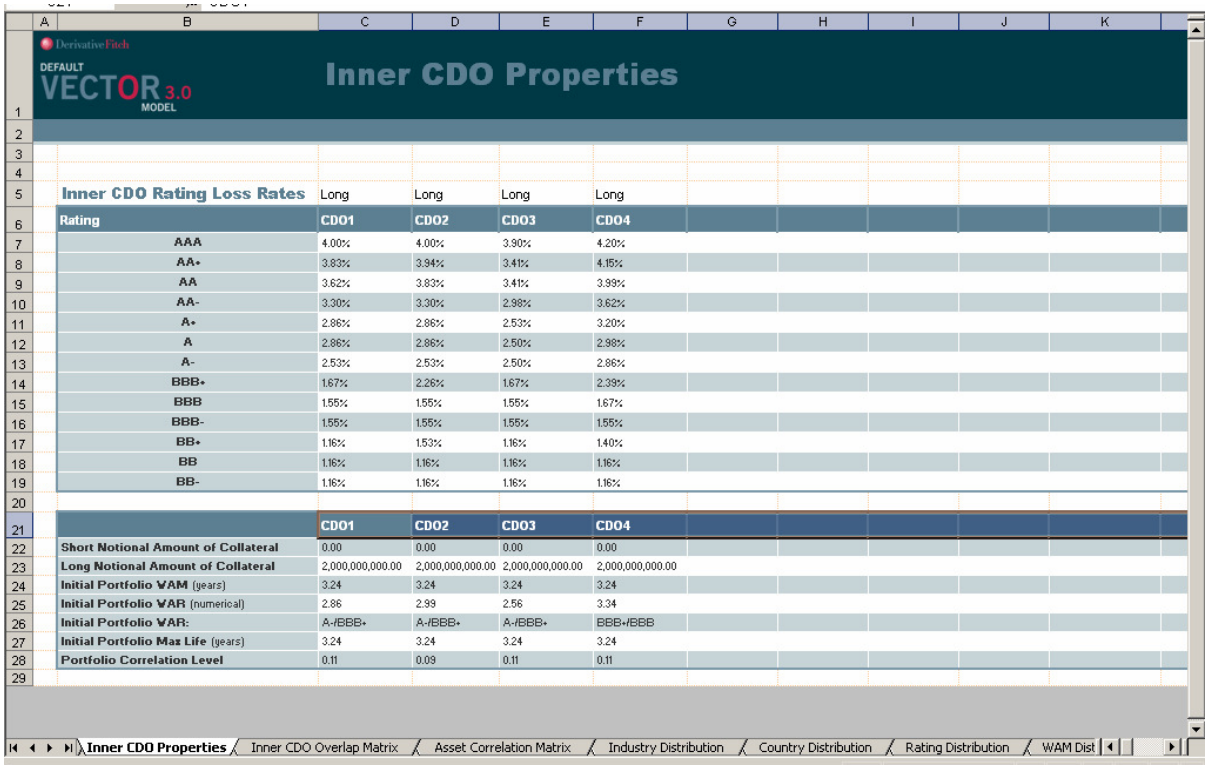
The portfolio loss distribution shows the frequency of a particular portfolio loss rate in a simulation. As the actual distribution may be too large, the model separates the results into 10,000 bins.



E. Inner CDO Properties

This worksheet shows the rating loss rates for each of the individual CDOs specified on the Reference Obligations worksheet. Rather than running individual synthetic CDO portfolios, VECTOR 3.1 can model the universe of underlying corporates and determines the loss distribution and RLR's for multiple CDO portfolios. The user can load up to 50 CDO portfolios on the worksheet Reference Obligations and select up to 10 out of the 50 to be analyzed in each model run, by selecting Analyze Inner CDOs on the Main worksheet.

For synthetic structures the RLR provides an indication of the minimum threshold amounts for a particular rating.



DerivativeFitch

DEFAULT VECTOR 3.0 MODEL

Inner CDO Properties

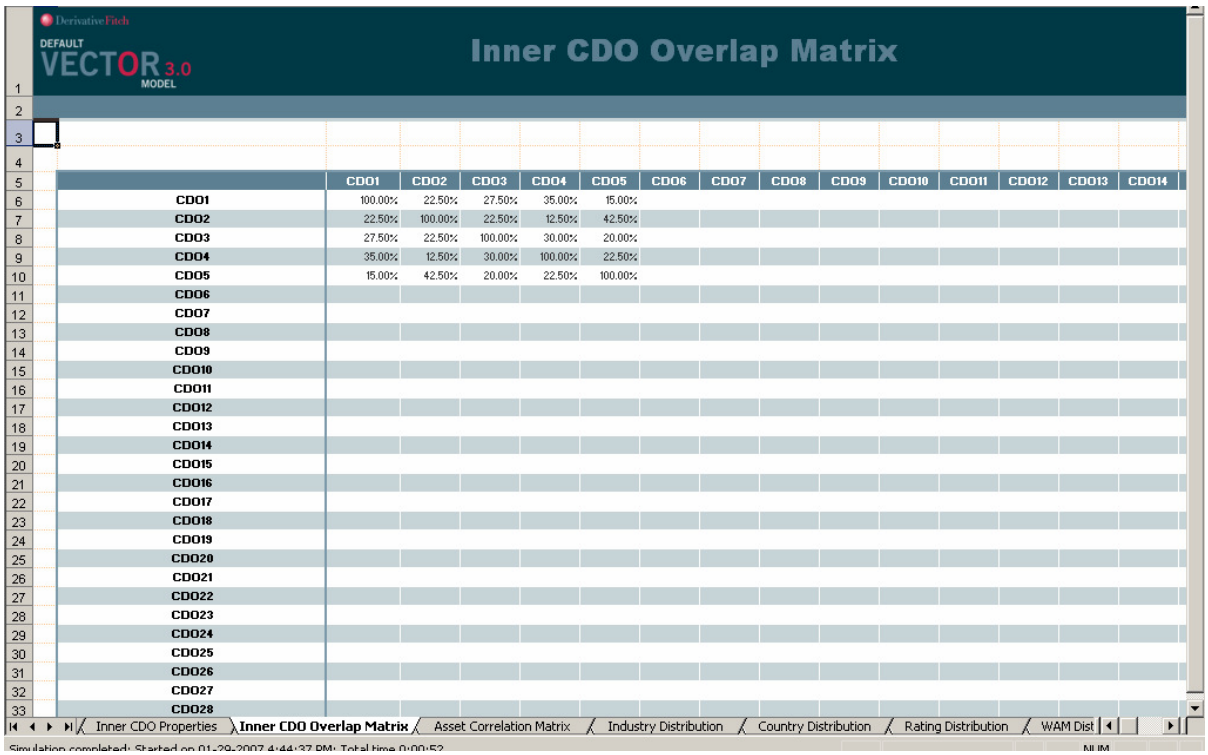
Inner CDO Rating Loss Rates	Long	Long	Long	Long
Rating	CDO1	CDO2	CDO3	CDO4
AAA	4.00%	4.00%	3.90%	4.20%
AA+	3.83%	3.94%	3.41%	4.15%
AA	3.62%	3.83%	3.41%	3.99%
AA-	3.30%	3.30%	2.98%	3.62%
A+	2.86%	2.86%	2.53%	3.20%
A	2.86%	2.86%	2.50%	2.98%
A-	2.53%	2.53%	2.50%	2.86%
BBB+	1.67%	2.26%	1.67%	2.39%
BBB	1.55%	1.55%	1.55%	1.67%
BBB-	1.55%	1.55%	1.55%	1.55%
BB+	1.16%	1.53%	1.16%	1.40%
BB	1.16%	1.16%	1.16%	1.16%
BB-	1.16%	1.16%	1.16%	1.16%

	CDO1	CDO2	CDO3	CDO4
Short Notional Amount of Collateral	0.00	0.00	0.00	0.00
Long Notional Amount of Collateral	2,000,000,000.00	2,000,000,000.00	2,000,000,000.00	2,000,000,000.00
Initial Portfolio WAM (years)	3.24	3.24	3.24	3.24
Initial Portfolio WAR (numerical)	2.86	2.99	2.56	3.34
Initial Portfolio WAR:	A-/BBB+	A-/BBB+	A-/BBB+	BBB+/BBB
Initial Portfolio Max Life (years)	3.24	3.24	3.24	3.24
Portfolio Correlation Level	0.11	0.09	0.11	0.11

Inner CDO Properties | Inner CDO Overlap Matrix | Asset Correlation Matrix | Industry Distribution | Country Distribution | Rating Distribution | WAM Dist

F. Inner CDO Overlap Matrix

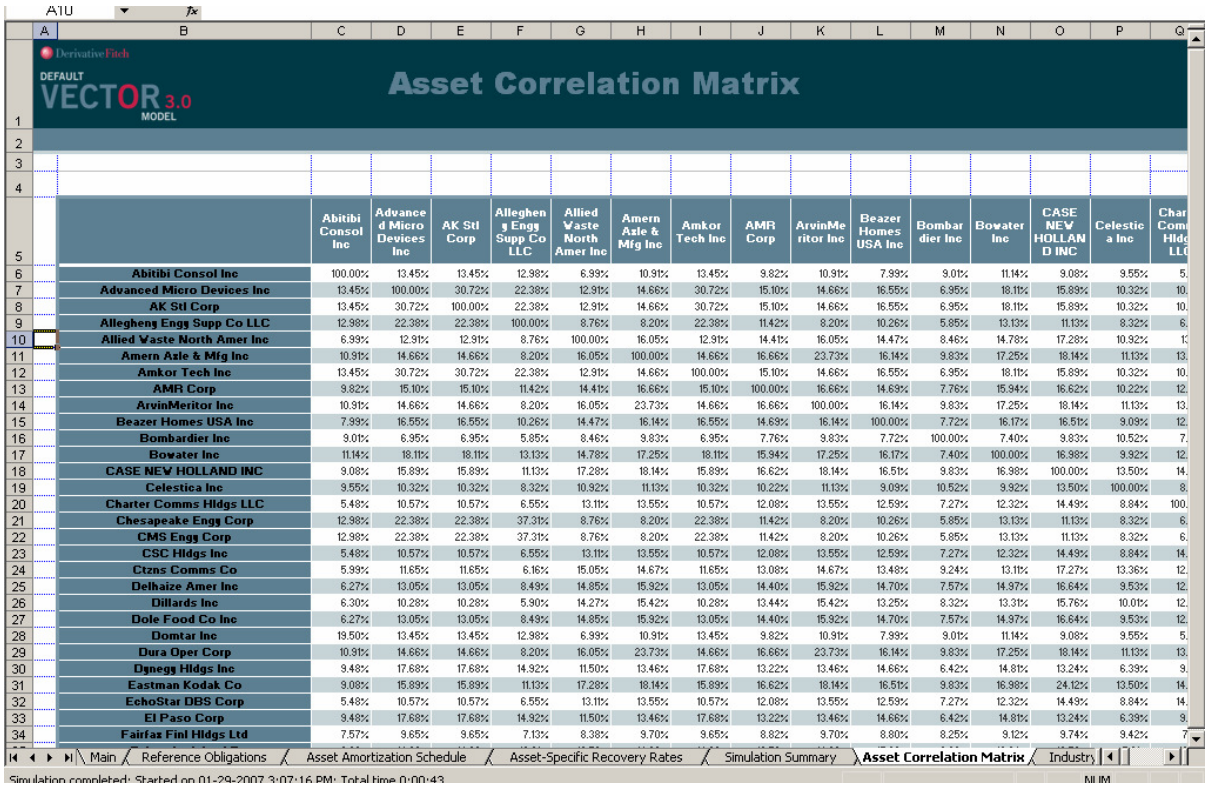
This worksheet shows the pair-wise overlap matrix for the individual CDO portfolios specified on the Reference Obligations sheet. The overlap or crossholdings is calculated as the number of corporate entities that are the same in any two CDO portfolios, expressed as a percentage of the total number of reference assets in the CDOs (if different, than the lower of the two). For example, in a typical synthetic CDO squared structure the number of corporate reference entities in each of the inner CDOs is 100. Assuming that 20 of the reference corporates are the same in two of the CDO portfolios, the pair-wise overlap would be 20%.



	CDO1	CDO2	CDO3	CDO4	CDO5	CDO6	CDO7	CDO8	CDO9	CDO10	CDO11	CDO12	CDO13	CDO14
CDO1	100.00%	22.50%	27.50%	35.00%	15.00%									
CDO2	22.50%	100.00%	22.50%	12.50%	42.50%									
CDO3	27.50%	22.50%	100.00%	30.00%	20.00%									
CDO4	35.00%	12.50%	30.00%	100.00%	22.50%									
CDO5	15.00%	42.50%	20.00%	22.50%	100.00%									
CDO6														
CDO7														
CDO8														
CDO9														
CDO10														
CDO11														
CDO12														
CDO13														
CDO14														
CDO15														
CDO16														
CDO17														
CDO18														
CDO19														
CDO20														
CDO21														
CDO22														
CDO23														
CDO24														
CDO25														
CDO26														
CDO27														
CDO28														

G. Asset Correlation Matrix

In the VECTOR 3.1 model the user can either (i) specify a particular pair-wise asset correlation that will then be used between all assets in a portfolio; (ii) use Fitch's sector correlation assumptions; or (iii) create a unique user-defined correlation matrix. These choices will result in a series of pair-wise sector correlations between any two assets which are displayed in the Asset Correlation Matrix.



DerivativeFitch

DEFAULT VECTOR 3.0 MODEL

Asset Correlation Matrix

	Abitibi Consol Inc	Advanced Micro Devices Inc	AK Stl Corp	Allegheny Engg Supp Co LLC	Allied Waste North Amer Inc	Amern Axle & Mfg Inc	Amkor Tech Inc	AMR Corp	ArvinMeritor Inc	Beazer Homes USA Inc	Bombardier Inc	Bowater Inc	CASE NEV HOLLAND INC	Celestica Inc	Char Comm Hldg LL
Abitibi Consol Inc	100.00%	13.45%	13.45%	12.98%	6.99%	10.91%	13.45%	9.82%	10.91%	7.99%	9.01%	11.14%	9.08%	9.55%	5.
Advanced Micro Devices Inc	13.45%	100.00%	30.72%	22.38%	12.91%	14.66%	30.72%	15.10%	14.66%	16.55%	6.95%	18.11%	15.89%	10.32%	10.
AK Stl Corp	13.45%	30.72%	100.00%	22.38%	12.91%	14.66%	30.72%	15.10%	14.66%	16.55%	6.95%	18.11%	15.89%	10.32%	10.
Allegheny Engg Supp Co LLC	12.98%	22.38%	22.38%	100.00%	8.76%	8.20%	22.38%	11.42%	8.20%	10.26%	5.85%	13.13%	11.13%	8.32%	6.
Allied Waste North Amer Inc	6.99%	12.91%	12.91%	8.76%	100.00%	16.05%	12.91%	14.41%	16.05%	14.47%	8.46%	14.78%	17.28%	10.92%	13
Amern Axle & Mfg Inc	10.91%	14.66%	14.66%	8.20%	16.05%	100.00%	14.66%	16.66%	23.73%	16.14%	9.83%	17.25%	18.14%	11.13%	13.
Amkor Tech Inc	13.45%	30.72%	30.72%	22.38%	12.91%	14.66%	100.00%	15.10%	14.66%	16.55%	6.95%	18.11%	15.89%	10.32%	10.
AMR Corp	9.82%	15.10%	15.10%	11.42%	14.41%	16.66%	15.10%	100.00%	16.66%	14.69%	7.76%	15.94%	16.62%	10.22%	12.
ArvinMeritor Inc	10.91%	14.66%	14.66%	8.20%	16.05%	23.73%	14.66%	16.66%	100.00%	16.14%	9.83%	17.25%	18.14%	11.13%	13.
Beazer Homes USA Inc	7.99%	16.55%	16.55%	10.26%	14.47%	16.14%	16.55%	14.69%	16.14%	100.00%	7.72%	16.17%	16.51%	9.09%	12.
Bombardier Inc	9.01%	6.95%	6.95%	5.85%	8.46%	9.83%	6.95%	7.76%	9.83%	7.72%	100.00%	7.40%	9.83%	10.52%	7.
Bowater Inc	11.14%	18.11%	18.11%	13.13%	14.78%	17.25%	18.11%	15.94%	17.25%	16.17%	7.40%	100.00%	16.98%	9.92%	12.
CASE NEV HOLLAND INC	9.08%	15.89%	15.89%	11.13%	17.28%	18.14%	15.89%	16.62%	18.14%	16.51%	9.83%	16.98%	100.00%	13.50%	14.
Celestica Inc	9.55%	10.32%	10.32%	8.32%	10.92%	11.13%	10.32%	10.22%	11.13%	9.09%	10.52%	9.92%	13.50%	100.00%	8.
Charter Comms Hldgs LLC	5.48%	10.57%	10.57%	6.55%	13.11%	13.55%	10.57%	12.08%	13.55%	12.59%	7.27%	12.32%	14.49%	8.84%	100.
Chesapeake Engg Corp	12.98%	22.38%	22.38%	37.31%	8.76%	8.20%	22.38%	11.42%	8.20%	10.26%	5.85%	13.13%	11.13%	8.32%	6.
CMS Engg Corp	12.98%	22.38%	22.38%	37.31%	8.76%	8.20%	22.38%	11.42%	8.20%	10.26%	5.85%	13.13%	11.13%	8.32%	6.
CSC Hldgs Inc	5.48%	10.57%	10.57%	6.55%	13.11%	13.55%	10.57%	12.08%	13.55%	12.59%	7.27%	12.32%	14.49%	8.84%	14.
Ctzns Comms Co	5.99%	11.65%	11.65%	6.16%	15.05%	14.67%	11.65%	13.08%	14.67%	13.48%	9.24%	13.11%	17.27%	13.36%	12.
Delhaize Amer Inc	6.27%	13.05%	13.05%	8.49%	14.85%	15.92%	13.05%	14.40%	15.92%	14.70%	7.57%	14.97%	16.64%	9.53%	12.
Dillards Inc	6.30%	10.28%	10.28%	5.90%	14.27%	15.42%	10.28%	13.44%	15.42%	13.25%	8.32%	13.31%	15.76%	10.01%	12.
Dole Food Co Inc	6.27%	13.05%	13.05%	8.49%	14.85%	15.92%	13.05%	14.40%	15.92%	14.70%	7.57%	14.97%	16.64%	9.53%	12.
Domtar Inc	19.50%	13.45%	13.45%	12.98%	6.99%	10.91%	13.45%	9.82%	10.91%	7.99%	9.01%	11.14%	9.08%	9.55%	5.
Dura Oper Corp	10.91%	14.66%	14.66%	8.20%	16.05%	23.73%	14.66%	16.66%	23.73%	16.14%	9.83%	17.25%	18.14%	11.13%	13.
Dynegy Hldgs Inc	9.48%	17.68%	17.68%	14.92%	11.50%	13.46%	17.68%	13.22%	13.46%	14.66%	6.42%	14.81%	13.24%	6.39%	9.
Eastman Kodak Co	9.08%	15.89%	15.89%	11.13%	17.28%	18.14%	15.89%	16.62%	18.14%	16.51%	9.83%	16.98%	24.12%	13.50%	14.
EchoStar DBS Corp	5.48%	10.57%	10.57%	6.55%	13.11%	13.55%	10.57%	12.08%	13.55%	12.59%	7.27%	12.32%	14.49%	8.84%	14.
El Paso Corp	9.48%	17.68%	17.68%	14.92%	11.50%	13.46%	17.68%	13.22%	13.46%	14.66%	6.42%	14.81%	13.24%	6.39%	9.
Fairfax Finl Hldgs Ltd	7.57%	9.65%	9.65%	7.13%	8.38%	9.70%	9.65%	8.82%	9.70%	8.80%	8.25%	9.12%	9.74%	9.42%	7

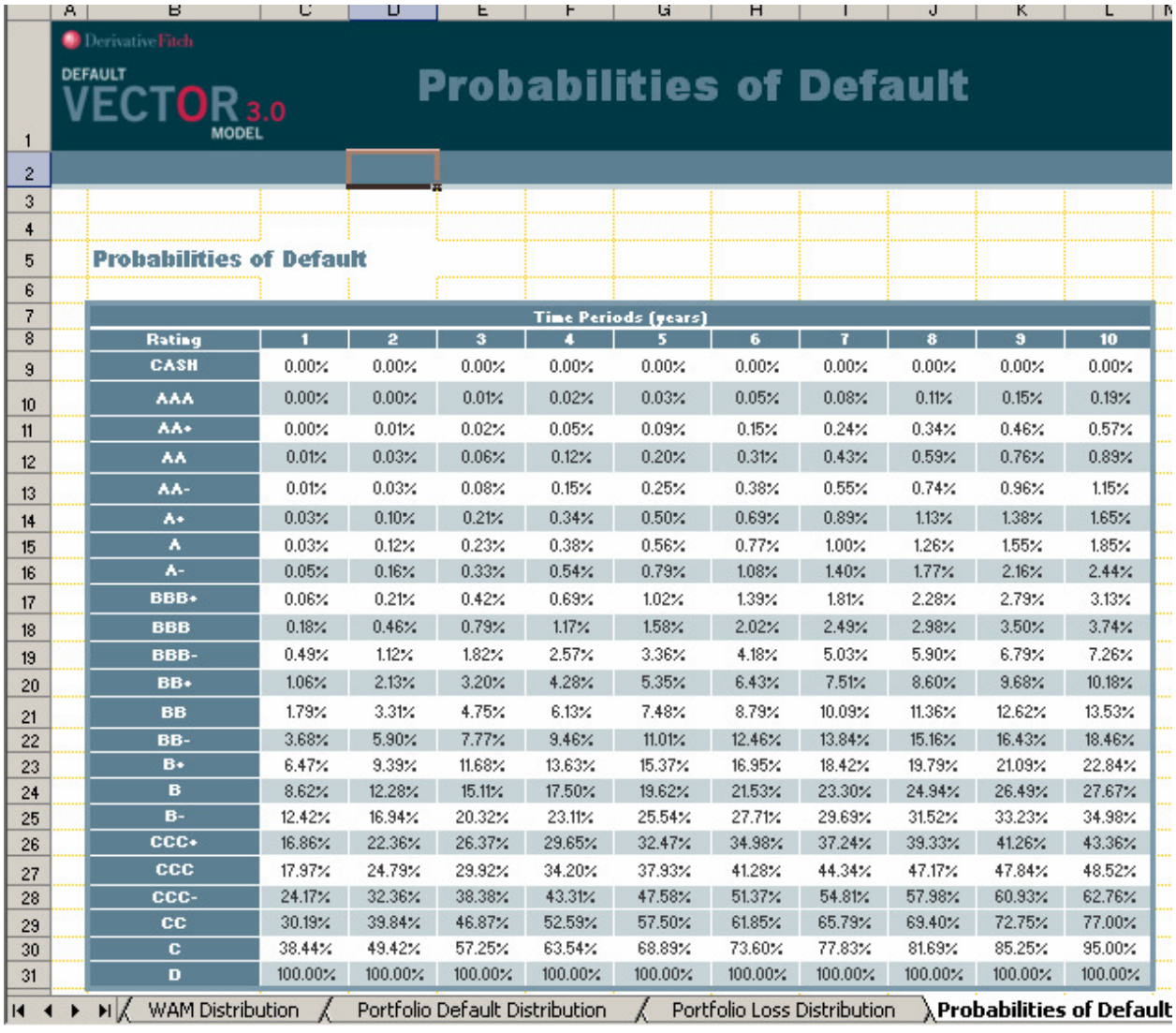
Main | Reference Obligations | Asset Amortization Schedule | Asset-Specific Recovery Rates | Simulation Summary | Asset Correlation Matrix | Industry

Simulation completed: Started on 01-29-2007 3:07:16 PM; Total time 0:00:43

VECTOR Assumptions

A. Probability of Default

This table shows Fitch's CDO default rates for various terms (the maximum is 10 years) and rating categories. These are cumulative default rates. This table also provides the basis for determining the RDR and RLR.



DerivativeFitch
DEFAULT VECTOR 3.0 MODEL

Probabilities of Default

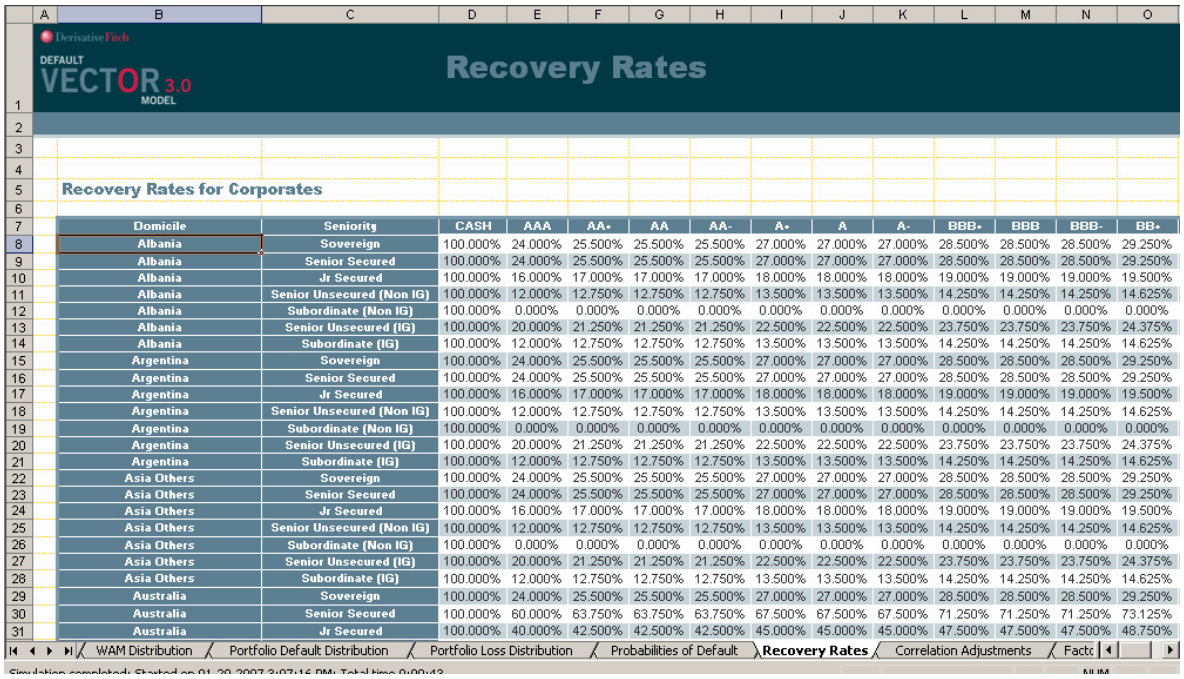
Probabilities of Default

	Time Periods (years)									
Rating	1	2	3	4	5	6	7	8	9	10
CASH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
AAA	0.00%	0.00%	0.01%	0.02%	0.03%	0.05%	0.08%	0.11%	0.15%	0.19%
AA+	0.00%	0.01%	0.02%	0.05%	0.09%	0.15%	0.24%	0.34%	0.46%	0.57%
AA	0.01%	0.03%	0.06%	0.12%	0.20%	0.31%	0.43%	0.59%	0.76%	0.89%
AA-	0.01%	0.03%	0.08%	0.15%	0.25%	0.38%	0.55%	0.74%	0.96%	1.15%
A+	0.03%	0.10%	0.21%	0.34%	0.50%	0.69%	0.89%	1.13%	1.38%	1.65%
A	0.03%	0.12%	0.23%	0.38%	0.56%	0.77%	1.00%	1.26%	1.55%	1.85%
A-	0.05%	0.16%	0.33%	0.54%	0.79%	1.08%	1.40%	1.77%	2.16%	2.44%
BBB+	0.06%	0.21%	0.42%	0.69%	1.02%	1.39%	1.81%	2.28%	2.79%	3.13%
BBB	0.18%	0.46%	0.79%	1.17%	1.58%	2.02%	2.49%	2.98%	3.50%	3.74%
BBB-	0.49%	1.12%	1.82%	2.57%	3.36%	4.18%	5.03%	5.90%	6.79%	7.26%
BB+	1.06%	2.13%	3.20%	4.28%	5.35%	6.43%	7.51%	8.60%	9.68%	10.18%
BB	1.79%	3.31%	4.75%	6.13%	7.48%	8.79%	10.09%	11.36%	12.62%	13.53%
BB-	3.68%	5.90%	7.77%	9.46%	11.01%	12.46%	13.84%	15.16%	16.43%	18.46%
B+	6.47%	9.39%	11.68%	13.63%	15.37%	16.95%	18.42%	19.79%	21.09%	22.84%
B	8.62%	12.28%	15.11%	17.50%	19.62%	21.53%	23.30%	24.94%	26.49%	27.67%
B-	12.42%	16.94%	20.32%	23.11%	25.54%	27.71%	29.69%	31.52%	33.23%	34.98%
CCC+	16.86%	22.36%	26.37%	29.65%	32.47%	34.98%	37.24%	39.33%	41.26%	43.36%
CCC	17.97%	24.79%	29.92%	34.20%	37.93%	41.28%	44.34%	47.17%	47.84%	48.52%
CCC-	24.17%	32.36%	38.38%	43.31%	47.58%	51.37%	54.81%	57.98%	60.93%	62.76%
CC	30.19%	39.84%	46.87%	52.59%	57.50%	61.85%	65.79%	69.40%	72.75%	77.00%
C	38.44%	49.42%	57.25%	63.54%	68.89%	73.60%	77.83%	81.69%	85.25%	95.00%
D	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

WAM Distribution | Portfolio Default Distribution | Portfolio Loss Distribution | Probabilities of Default

B. Recovery Rates

This table contains Fitch's recovery rate assumptions used in the model, listed in tabular format and organised by Country and Asset Type. Recovery rates are also influenced by the rating scenario: the higher the rating stress, the lower the expected recovery. The applicable recovery rate for each asset is selected by the model based on geographic location and asset type. Please scroll to the right of the sheet for the recovery rates for structure finance securities.



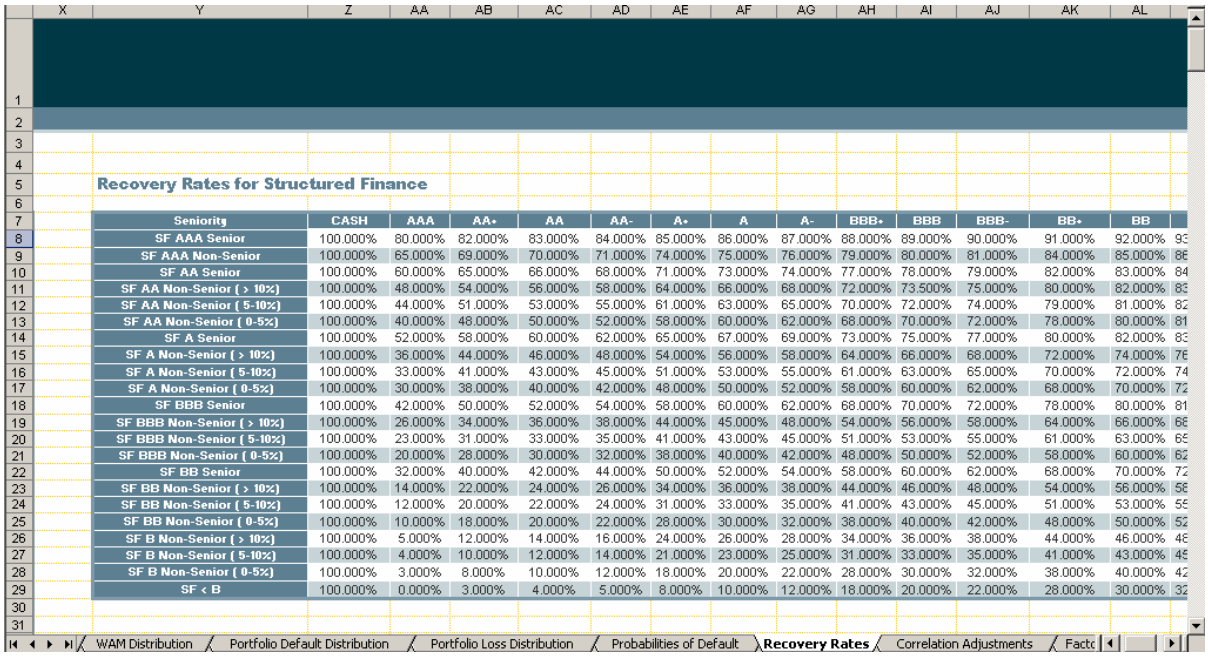
DerivativeFitch
DEFAULT VECTOR 3.0 MODEL

Recovery Rates

Recovery Rates for Corporates

Domicile	Seniority	CASH	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+
Albania	Sovereign	100.000%	24.000%	25.500%	25.500%	25.500%	27.000%	27.000%	27.000%	28.500%	28.500%	28.500%	29.250%
Albania	Senior Secured	100.000%	24.000%	25.500%	25.500%	25.500%	27.000%	27.000%	27.000%	28.500%	28.500%	28.500%	29.250%
Albania	Jr Secured	100.000%	16.000%	17.000%	17.000%	17.000%	18.000%	18.000%	18.000%	19.000%	19.000%	19.000%	19.500%
Albania	Senior Unsecured (Non IG)	100.000%	12.000%	12.750%	12.750%	12.750%	13.500%	13.500%	13.500%	14.250%	14.250%	14.250%	14.625%
Albania	Subordinate (Non IG)	100.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Albania	Senior Unsecured (IG)	100.000%	20.000%	21.250%	21.250%	21.250%	22.500%	22.500%	22.500%	23.750%	23.750%	23.750%	24.375%
Albania	Subordinate (IG)	100.000%	12.000%	12.750%	12.750%	12.750%	13.500%	13.500%	13.500%	14.250%	14.250%	14.250%	14.625%
Argentina	Sovereign	100.000%	24.000%	25.500%	25.500%	25.500%	27.000%	27.000%	27.000%	28.500%	28.500%	28.500%	29.250%
Argentina	Senior Secured	100.000%	24.000%	25.500%	25.500%	25.500%	27.000%	27.000%	27.000%	28.500%	28.500%	28.500%	29.250%
Argentina	Jr Secured	100.000%	16.000%	17.000%	17.000%	17.000%	18.000%	18.000%	18.000%	19.000%	19.000%	19.000%	19.500%
Argentina	Senior Unsecured (Non IG)	100.000%	12.000%	12.750%	12.750%	12.750%	13.500%	13.500%	13.500%	14.250%	14.250%	14.250%	14.625%
Argentina	Subordinate (Non IG)	100.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Argentina	Senior Unsecured (IG)	100.000%	20.000%	21.250%	21.250%	21.250%	22.500%	22.500%	22.500%	23.750%	23.750%	23.750%	24.375%
Argentina	Subordinate (IG)	100.000%	12.000%	12.750%	12.750%	12.750%	13.500%	13.500%	13.500%	14.250%	14.250%	14.250%	14.625%
Asia Others	Sovereign	100.000%	24.000%	25.500%	25.500%	25.500%	27.000%	27.000%	27.000%	28.500%	28.500%	28.500%	29.250%
Asia Others	Senior Secured	100.000%	24.000%	25.500%	25.500%	25.500%	27.000%	27.000%	27.000%	28.500%	28.500%	28.500%	29.250%
Asia Others	Jr Secured	100.000%	16.000%	17.000%	17.000%	17.000%	18.000%	18.000%	18.000%	19.000%	19.000%	19.000%	19.500%
Asia Others	Senior Unsecured (Non IG)	100.000%	12.000%	12.750%	12.750%	12.750%	13.500%	13.500%	13.500%	14.250%	14.250%	14.250%	14.625%
Asia Others	Subordinate (Non IG)	100.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Asia Others	Senior Unsecured (IG)	100.000%	20.000%	21.250%	21.250%	21.250%	22.500%	22.500%	22.500%	23.750%	23.750%	23.750%	24.375%
Asia Others	Subordinate (IG)	100.000%	12.000%	12.750%	12.750%	12.750%	13.500%	13.500%	13.500%	14.250%	14.250%	14.250%	14.625%
Australia	Sovereign	100.000%	24.000%	25.500%	25.500%	25.500%	27.000%	27.000%	27.000%	28.500%	28.500%	28.500%	29.250%
Australia	Senior Secured	100.000%	60.000%	63.750%	63.750%	63.750%	67.500%	67.500%	67.500%	71.250%	71.250%	71.250%	73.125%
Australia	Jr Secured	100.000%	40.000%	42.500%	42.500%	42.500%	45.000%	45.000%	45.000%	47.500%	47.500%	47.500%	48.750%

WAM Distribution | Portfolio Default Distribution | Portfolio Loss Distribution | Probabilities of Default | **Recovery Rates** | Correlation Adjustments | Facto



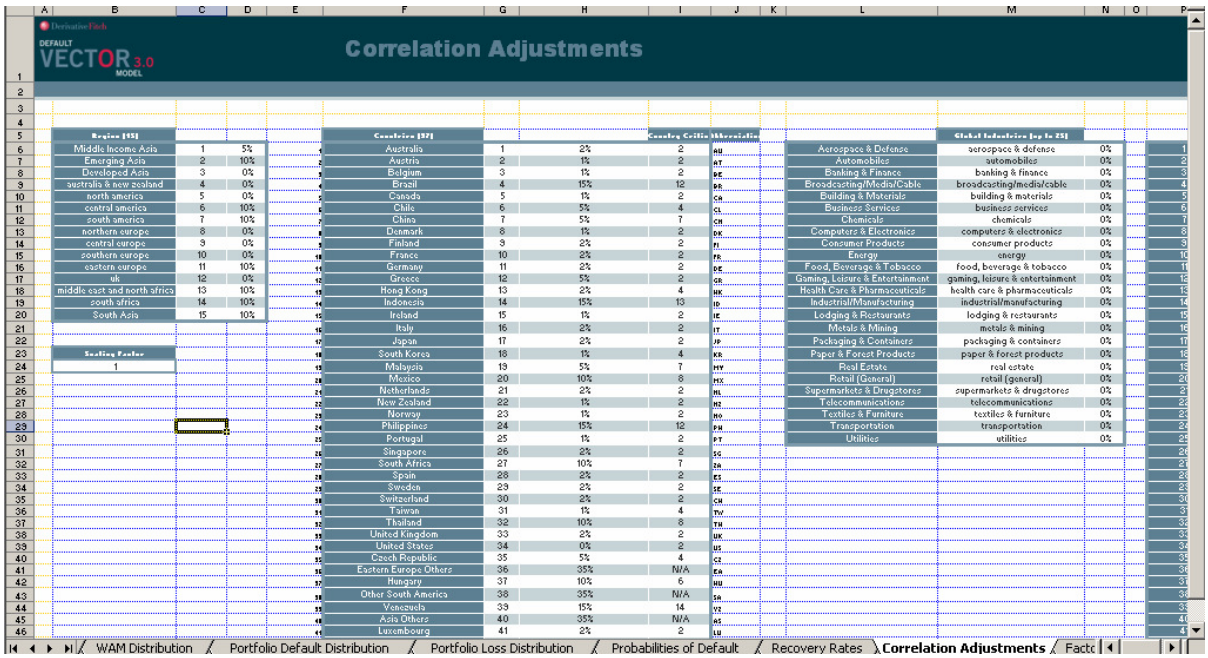
Recovery Rates for Structured Finance

Seniority	CASH	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB
SF AAA Senior	100.000%	80.000%	82.000%	83.000%	84.000%	85.000%	86.000%	87.000%	88.000%	89.000%	90.000%	91.000%	92.000%
SF AAA Non-Senior	100.000%	65.000%	69.000%	70.000%	71.000%	74.000%	75.000%	76.000%	79.000%	80.000%	81.000%	84.000%	85.000%
SF AA Senior	100.000%	60.000%	65.000%	66.000%	68.000%	71.000%	73.000%	74.000%	77.000%	78.000%	79.000%	82.000%	83.000%
SF AA Non-Senior (> 10%)	100.000%	48.000%	54.000%	56.000%	58.000%	64.000%	66.000%	68.000%	72.000%	73.500%	75.000%	80.000%	82.000%
SF AA Non-Senior (5-10%)	100.000%	44.000%	51.000%	53.000%	55.000%	61.000%	63.000%	65.000%	70.000%	72.000%	74.000%	79.000%	81.000%
SF AA Non-Senior (0-5%)	100.000%	40.000%	48.000%	50.000%	52.000%	58.000%	60.000%	62.000%	68.000%	70.000%	72.000%	78.000%	80.000%
SF A Senior	100.000%	52.000%	58.000%	60.000%	62.000%	65.000%	67.000%	69.000%	73.000%	75.000%	77.000%	80.000%	82.000%
SF A Non-Senior (> 10%)	100.000%	36.000%	44.000%	46.000%	48.000%	54.000%	56.000%	58.000%	64.000%	66.000%	68.000%	72.000%	74.000%
SF A Non-Senior (5-10%)	100.000%	33.000%	41.000%	43.000%	45.000%	51.000%	53.000%	55.000%	61.000%	63.000%	65.000%	70.000%	72.000%
SF A Non-Senior (0-5%)	100.000%	30.000%	38.000%	40.000%	42.000%	48.000%	50.000%	52.000%	58.000%	60.000%	62.000%	68.000%	70.000%
SF BBB Senior	100.000%	42.000%	50.000%	52.000%	54.000%	58.000%	60.000%	62.000%	68.000%	70.000%	72.000%	78.000%	80.000%
SF BBB Non-Senior (> 10%)	100.000%	26.000%	34.000%	36.000%	38.000%	44.000%	45.000%	48.000%	54.000%	56.000%	58.000%	64.000%	66.000%
SF BBB Non-Senior (5-10%)	100.000%	23.000%	31.000%	33.000%	35.000%	41.000%	43.000%	45.000%	51.000%	53.000%	55.000%	61.000%	63.000%
SF BBB Non-Senior (0-5%)	100.000%	20.000%	28.000%	30.000%	32.000%	38.000%	40.000%	42.000%	48.000%	50.000%	52.000%	58.000%	60.000%
SF BB Senior	100.000%	32.000%	40.000%	42.000%	44.000%	50.000%	52.000%	54.000%	58.000%	60.000%	62.000%	68.000%	70.000%
SF BB Non-Senior (> 10%)	100.000%	14.000%	22.000%	24.000%	26.000%	34.000%	36.000%	38.000%	44.000%	46.000%	48.000%	54.000%	56.000%
SF BB Non-Senior (5-10%)	100.000%	12.000%	20.000%	22.000%	24.000%	31.000%	33.000%	35.000%	41.000%	43.000%	45.000%	51.000%	53.000%
SF BB Non-Senior (0-5%)	100.000%	10.000%	18.000%	20.000%	22.000%	28.000%	30.000%	32.000%	38.000%	40.000%	42.000%	48.000%	50.000%
SF B Non-Senior (> 10%)	100.000%	5.000%	12.000%	14.000%	16.000%	24.000%	26.000%	28.000%	34.000%	36.000%	38.000%	44.000%	46.000%
SF B Non-Senior (5-10%)	100.000%	4.000%	10.000%	12.000%	14.000%	21.000%	23.000%	25.000%	31.000%	33.000%	35.000%	41.000%	43.000%
SF B Non-Senior (0-5%)	100.000%	3.000%	8.000%	10.000%	12.000%	18.000%	20.000%	22.000%	28.000%	30.000%	32.000%	38.000%	40.000%
SF < B	100.000%	0.000%	3.000%	4.000%	5.000%	8.000%	10.000%	12.000%	18.000%	20.000%	22.000%	28.000%	30.000%

WAM Distribution | Portfolio Default Distribution | Portfolio Loss Distribution | Probabilities of Default | **Recovery Rates** | Correlation Adjustments | Facto

C. Correlation Adjustments

As part of Fitch's criteria, adjustments are made to the correlation based on Region, Country and Industry. Those adjustments are displayed on the second to last tab.



DEFAULT VECTOR 3.0 MODEL

Correlation Adjustments

Region [15]		
Middle Income Asia	1	5%
Emerging Asia	2	10%
Developed Asia	3	0%
australia & new zealand	4	0%
north america	5	0%
central america	6	10%
south america	7	10%
northern europe	8	0%
central europe	9	0%
southern europe	10	0%
eastern europe	11	10%
uk	12	0%
middle east and north africa	13	10%
south africa	14	10%
South Asia	15	10%

Scaling Factor
1

Countries [37]			
Australia	1	2%	2
Austria	2	1%	2
Belgium	3	1%	2
Brazil	4	15%	12
Canada	5	1%	2
Chile	6	5%	4
China	7	5%	7
Denmark	8	1%	2
Finland	9	2%	2
France	10	2%	2
Germany	11	2%	2
Greece	12	5%	2
Hong Kong	13	2%	4
Indonesia	14	15%	13
Ireland	15	1%	2
Italy	16	2%	2
Japan	17	2%	2
South Korea	18	1%	4
Malaysia	19	5%	7
Mexico	20	10%	8
Netherlands	21	2%	2
New Zealand	22	1%	2
Norway	23	1%	2
Philippines	24	15%	12
Portugal	25	1%	2
Singapore	26	2%	2
South Africa	27	10%	7
Spain	28	2%	2
Sweden	29	2%	2
Switzerland	30	2%	2
Taiwan	31	1%	4
Thailand	32	10%	8
United Kingdom	33	2%	2
United States	34	0%	2
Czech Republic	35	5%	4
Eastern Europe Others	36	35%	N/A
Hungary	37	10%	6
Other South America	38	35%	N/A
Venezuela	39	15%	14
Asia Others	40	35%	N/A
Luxembourg	41	2%	2

Country Credit Abbreviation

Global Industries [up to 25]		
Aerospace & Defense	aerospace & defense	0%
Automobiles	automobiles	0%
Banking & Finance	banking & finance	0%
Broadcasting/Media/Cable	broadcasting/media/cable	0%
Building & Materials	building & materials	0%
Business Services	business services	0%
Chemicals	chemicals	0%
Computers & Electronics	computers & electronics	0%
Consumer Products	consumer products	0%
Energy	energy	0%
Food, Beverage & Tobacco	food, beverage & tobacco	0%
Gaming, Leisure & Entertainment	gaming, leisure & entertainment	0%
Health Care & Pharmaceuticals	health care & pharmaceuticals	0%
Industrial/Manufacturing	industrial/manufacturing	0%
Lodging & Restaurants	lodging & restaurants	0%
Metals & Mining	metals & mining	0%
Packaging & Containers	packaging & containers	0%
Paper & Forest Products	paper & forest products	0%
Real Estate	real estate	0%
Retail (General)	retail (general)	0%
Supermarkets & Drugstores	supermarkets & drugstores	0%
Telecommunications	telecommunications	0%
Textiles & Furniture	textiles & furniture	0%
Transportation	transportation	0%
Utilities	utilities	0%

WAM Distribution | Portfolio Default Distribution | Portfolio Loss Distribution | Probabilities of Default | Recovery Rates | Correlation Adjustments | Facto

D. Correlation Factors

Fitch's default VECTOR model is a multi factor model and the factors, for both Corporates and Structured Finance, are displayed on the last tab.

	A	B	C	D	E	F	G	H	I	J	
1	Corp Sector Average Factors	1	2	3	4	5	6	7	8	9	
2	1	-0.00055	0.000180095	0.00062716	-0.000682	0.000273717	-0.000435	-0.000983102	0.000373	-0.000457212	-0.0
3	2	-0.000504178	0.000443508	0.00109084	-0.001196682	0.001081816	-0.00122458	-0.00070069	0.000185	-0.00103	-0.00
4	3	-0.000826	-0.0000167	0.00069467	-0.001047936	0.000733415	-0.000921	-0.00136	0.000718047	0.0000309	-0.0(
5	4	-0.001904857	-0.000767623	0.00048643	-0.00208841	0.000059	-0.00186687	-0.001848688	0.000454608	-0.000173269	-0.00
6	5	-0.00133	0.000311	-0.0000665	-0.001672148	0.001183773	0.00019531	-0.002443162	0.000683574	-0.000634221	-0.00
7	6	-0.00196	-0.00199796	0.00099327	-0.00084442	0.000308295	-0.00182185	-0.002669292	0.000648664	0.000188123	-0.00
8	7	-0.000838	0.00019901	0.00017983	-0.002754268	0.00029254	-0.00085395	-0.001783611	-0.00068184	0.000232182	-0.00
9	8	-0.00175288	0.002323653	0.00141955	-0.000596752	-0.00047879	-0.00224911	0.001147751	0.001713324	-0.000429339	-0.00
10	9	-0.000353476	0.000594606	-0.00127487	-0.000288041	0.002135851	-0.00074368	-0.000629698	0.001267795	-0.000533031	-0.00
11	10	-0.00181491	0.000338098	0.00204826	-0.001100022	0.002818185	-0.00049097	-0.001066878	0.002342754	-0.00154247	-0.00
12	11	-0.000830624	-0.000190079	0.00086705	-0.001243744	0.000478454	-0.00100317	-0.001322527	0.000951698	-0.000289451	-0.00
13	12	-0.001253767	-0.00035763	0.00084008	-0.002271615	-0.0000745	-0.00146373	-0.001869094	0.000290559	-0.000206	-0.0
14	13	0.000244326	0.000891851	0.00058972	-0.001011661	0.000219507	-0.00046985	-0.001614525	0.000526761	-0.0000278	-0.00
15	14	-0.000601	-0.000315015	0.00248377	-0.000851355	0.001896051	-0.00080017	-0.000815853	0.001341821	-0.001499292	-0.00
16	15	-0.001598954	0.001948058	0.00057856	-0.002310924	-0.0015994	0.00028495	-0.00084281	-0.0000624	-0.001343217	-0.00
17	16	-0.000713338	0.001302009	0.00100954	-0.000465049	0.001653692	0.00111	-0.00126	0.0026	-0.002213444	-0.00
18	17	-0.000931179	-0.0000106	0.00114571	-0.001010455	-0.0000337	-0.00105968	-0.002121279	0.000389223	-0.000413293	-0.0(
19	18	-0.000975477	0.000485523	0.00028756	-0.00093753	0.000592536	0.00137319	-0.001877673	0.00062075	-0.001036197	-0.00
20	19	-0.000153356	-0.00087714	0.00040179	-0.000405	-0.000638	-0.00087071	-0.0009072	0.000928782	-0.000548475	-0.00
21	20	-0.001176737	0.000664624	0.00136236	-0.00161	0.00242	-0.001622	-0.0015967	0.000190756	-0.001525901	-0.0(
22	21	0.000438	-0.000775242	0.00121558	0.000655211	-0.00022094	-0.00028493	-0.000489893	-0.00049918	0.000923263	-0.00
23	22	-0.00123	-0.00000859	0.00025238	-0.00108407	0.000622565	0.00060553	-0.000609654	0.000812927	-0.001775788	-0.00
24	23	-0.001431437	0.001385296	0.00129429	-0.001197878	-0.00035343	-0.0006279	0.0000149	-0.00082369	-0.000933226	-0.00
25	24	-0.000286812	0.000655233	0.00087558	-0.000711431	0.000742285	-0.000806	-0.00189	0.000295532	-0.000660687	-0.00
26	25	-0.001307811	0.000238245	0.00149109	-0.000612357	0.001813132	-0.00137	-0.00116	0.001869841	-0.000298021	-0.00
27	26	0.000627514	0.0000814	0.00032547	0.000240945	-0.00044015	-0.0000303	-0.0000529	-0.00048684	0.000260668	0.0(
28	27	0.000700994	0.0000797	0.00036263	0.000249215	-0.00036161	-0.00033706	0.000143	-0.00025638	0.000644021	0.0
29	28	-0.000216467	-0.00070478	0.00080763	0.000565369	-0.00013765	-0.00214898	0.0000526	0.000343733	0.001966101	0.0(

Portfolio Default Distribution | Portfolio Loss Distribution | Probabilities of Default | Recovery Rates | Correlation Adjustments | Factor Exposure

Reference Entity Feed Set-up and Use

The Vector Reference Entity Feed (REF) allows the user to load a portfolio with all of the indicative Vector 3.1 mappings simply by uploading a portfolio of names, tickers, Markit RED codes or Markit RED names.

A. Download Instructions

The Reference Entity Feed is updated daily by Fitch, ensuring that the user has access to the most current information on their portfolio. The REF can be downloaded from www.fitchresearch.com by selecting:

Surveillance>CDO>Tools>Vector Reference Entity Feed

B. User Instructions

The worksheet called "Vector_Data_Feeder" contains a list of Reference Obligations widely referenced in Synthetic CDOs, with their required Vector 3.1 input fields, including the Fitch rating where applicable.

The worksheet called "Asset Browser" allows the user to prepare a portfolio in the format required for Vector 3.1. An example of the usable input fields is shown when the REF is first opened. This can be cleared by using the "Clear Portfolio" button.

The identifiers which can be used to search for reference entities are as follows:

- Asset Name
- Equity Ticker and Two Digit Exchange code
- Markit RED Code
- Markit RED Name

The asset name can be searched using the drop down box in Column B. Once selected, the cells containing the Asset Identifiers (Column M-Q) and the Vector 3.1 Portfolio Definition Sheet (Column U-AV) will be populated. An alternative method for populating this data is to paste one of the identifiers listed above into columns D-G.

If the identifier is not recognized in the REF, the error message "!! Error: Unrecognized ID" will be displayed in that row.
If more than one ID is used resulting in a conflict, the error message "!! Error: Multiple Conflicting IDs" will be displayed in that row.

The user field in column I allows the addition of comments or internal organizational identifiers.

Once a portfolio has been completed, it can be exported as a Vector 3.1 Portfolio File by using the "Save Portfolio" button. This file can then be uploaded directly into the Vector 3.1 model from the saved location. Details of exposure and deal structure can then be added.

Appendix I: Simulation Methodology

The VECTOR 3.1 engine, a C++ compiled programme with an Excel user interface, generates the random default scenarios using a multi-period Monte Carlo simulation, as described below:

Step 1. Computing Conditional Default Probabilities for each asset:

For each asset in a portfolio, VECTOR 3.1 determines the appropriate cumulative default rates for each year based on the asset's rating and the base default table shown on the VECTOR 3.1 Input Worksheet. These cumulative default rates are converted into conditional annual default rates corresponding to the time-step of the model, which represent the probability of default for year *x* conditional upon survival up to year *x*. For the first year, the conditional default rates are equivalent to the marginal default rate and thereafter, for each subsequent year, using the following formula:

$$P_i^M = \frac{P_i^C - P_{i-1}^C}{1 - P_{i-1}^C}$$

where:

P_i^C = is the cumulative default rate for year *i*

P_i^M = is the marginal default rate for year *i*

For example, the BBB cumulative default rates over five and six years are 1.89% and 2.3%, respectively; the conditional default probability of a hypothetical asset for year six, given its survival over the first five years, would be 0.42%.

The user can manually amend the default rate of any asset through the Default Probability Adjustment column on the Portfolio Definition Worksheet. For example, if 110% is entered, that asset's default rate will be scaled by 110%.

Step 2. Determining the default threshold for each time-step

Conditional default probabilities are converted into default thresholds to give an indication of default probability for a particular obligor (see below). The VECTOR 3.1 model assumes asset values are normally distributed, therefore, the default threshold is the inverse of the cumulative normal distribution of the conditional default rate. To continue the above example, the default threshold for year six would be:

$$\Phi^{-1}(0.42\%) = -2.637$$

Step 3. Generating correlated random variables

For an *N* asset portfolio, the model generates *N* random numbers from the standard normal distribution for each annual step of the simulation, correlated using a Normal Copula function to approximate the multivariate distribution of asset values. Technically, this is achieved through a Cholesky decomposition of the portfolio correlation matrix. The resulting Cholesky matrix is then multiplied by the VECTOR 3.1 of independent asset values to yield correlated asset values that reflect the particular correlation structure of this portfolio. While VECTOR 3.1 assumes the individual pair-wise correlations remain constant throughout the transaction, the multi-period framework does allow for time-varying correlation.

Step 4. Determining which assets default

The correlated random numbers, which represent the asset values for each obligor in a portfolio, are then compared to the corresponding default threshold. If the asset value as given by the random number falls below the default threshold, the model will register a default for this particular asset, which will be removed from the portfolio in subsequent periods. For each given simulation path, the asset can only default once.

Step 5. Aggregating simulation results

At the end of the simulation run, the model identifies which assets have been flagged as defaulted over the life of a transaction. For each of the defaulted assets the model accounts for the par value, which can be either the initial or then-current amount remaining at the time of default, depending on whether the user has specified an amortisation schedule. The model also computes the loss for each of the defaulted assets in each of the rating scenarios, taking into account the asset specific recovery rate. Finally, the model also records the year of each default.

Step 6. Default and Loss Distribution

The model then sorts the portfolio loss and default rates across all simulation runs and calculates incidence frequency. This is divided by the total number of simulations and then plotted to yield the portfolio default and loss distribution. This approach assumes that all simulation scenarios are equally likely to occur.

Appendix II: Pair-Wise Correlation

Based on these inputs the model constructs the pair-wise portfolio correlation table that will be used in the simulation.

For example, the pairwise correlation between two assets would be calculated as follows

- Base Case Correlation 10% ρ_0,
- Regional Correlation Premium 5% ρ_1,
- Sector Correlation Premium 10% ρ_2,

Case 1	Same assets	Same region	Same sector		100%
Case 2	Diff assets	Same region	Same sector	$\rho_0+\rho_1+\rho_2$	10%+5%+10%
Case 3	Diff assets	Same region	Diff sector	$\rho_0+\rho_1$	10%+5%
Case 4	Diff assets	Diff region	Same sector	$\rho_0+\rho_2$	10%+10%
Case 5	Diff assets	Diff region	Diff sector	ρ_0	10%

The user defined correlation option is based on the following factor model:

$$Y_k = \sqrt{\rho_0} \times F^G + \sqrt{\rho_i} \times F_i^R + \sqrt{\rho_j} \times F_j^S + \sqrt{1-\rho_i-\rho_j} \times \tilde{F}_k$$

where

ρ_i, ρ_j are correlation premiums for region and sector;

ρ_0 is the global base correlation;

F_i^R, F_j^S represent one of the six regional and sector factors;

F^G represents a base economic factor.

$\tilde{F}_k$ is a company specific factor.

The factors are assumed to be independent.

In addition, PCL is calculated, for any given Σ correlation matrix, is calculated as:

$$PCL = \sqrt{\sum_{i=1}^{N}\sum_{j=1}^{N}\left|\rho_{i,j}\right|^2} \Big/ \sqrt{N \times (N-1)}$$

$i \neq j$

where $\rho_{i,,j}$ is the pair-wise correlation between security *i* and *j* and *N* is the number of assets in the portfolio

Appendix III: Installation

A. System Requirements

PC

- 512+ MB Memory (2 GB recommended)
- 1.2+ GHz Processor Speed

- **Operating System**
- Windows NT, 2000, or XP

- **Software**
- WinZip
- Excel 2000 (Excel 97 is not supported, Excel 2003 has not been tested)

- **Other Requirements**
- You must have administrator rights for the pc to which you are downloading VECTOR 3.1. If you do not have these rights, please contact your IT department.
- Excel Security – In Excel, macros must be enabled for the model to function correctly. If you have administrator rights, you can change the security in Excel. To change macro security:
  - Open Excel.
  - Go to Tools→ Macro→ Security
  - Change the level to either Medium or Low. If you select Medium, you must click "Enable Macros" each time the model opens.

B. Installation Checklist

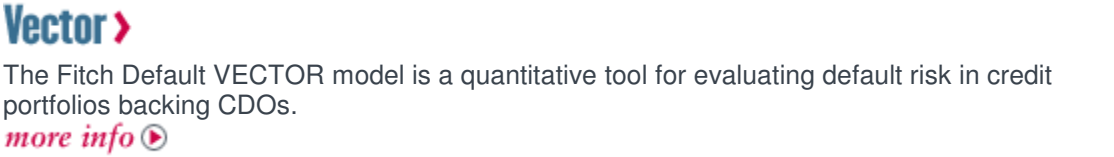
Before installing and or downloading the VECTOR 3.1 Model you must:

- Close all open programs.
- Meet the minimum requirements to access and install the model.
- Have administrator rights to install the VECTOR 3.1 Model.

C. Downloading the VECTOR 3.1 Model

Before you can download and install the VECTOR 3.1 Model you must have access to the Internet. To download the VECTOR 3.1 Model:

1. Open your **Internet** browser.
2. Type www.derivativefitch.com in the Address field. The DerivativeFitch Ratings website appears.
3. Click the **Credit Risk Models** tab.
   Click:


Vector
The Fitch Default VECTOR model is a quantitative tool for evaluating default risk in credit portfolios backing CDOs.
more info

4. Click :

5. A VECTOR model description and requirements page appears.
6. Scroll down and click **Download VECTOR3.1**
7. The Fitch CDO VECTOR 3.1 Program Agreement page appears.
8. Click '**I Accept**' if you agree to the terms and to download the VECTOR 3.1 Model. If you do not agree the terms indicated, you will not be able to download the application.
   A File Download window appears:
9. Click the **Save this file to disk** radio button.
10. Click **OK**. A Save As window appears:
11. Select a **folder location** for the self extracting executable.
12. Click **Save**. The file is saved to the selected location.

D. Installing the VECTOR 3.1 Model

Once you have downloaded the VECTOR 3.1 Model file you must install the application. To install the VECTOR 3.1 Model:

1. Locate and open the self extracting application file you saved to your PC.

2. Double-click the **VECTOR 3.x.x application** file.

3. The install process will run, you will have to confirm acceptance of the license agreement for a second time.

4. Click **Next**. A User Registration screen appears.

   You will be asked to enter your contact information. Please take a moment and enter your Name, Email Address, Company Name, and Phone Number. The remaining fields are optional.

5. An Extracting Files window may automatically appear. A Setup Status window appears. A message window may appear indicating the file process may take some time. An MS-DOS window automatically opens and closes. A Setup Complete window appears

6. Click **Finish.**

Please Note: The VECTOR 3.1 Model's installation wizard creates a subfolder saved in the location specified during installation. The subfolder only contains the latest version of the VECTOR 3.1 Model. Subsequent installations of VECTOR 3.1 will overwrite all files (including previous versions of the model) in the specified folder to assure that users have the latest version. For this reason, no working files should be stored in the specified folder.

E. Reinstalling the VECTOR 3.1 Model

When the VECTOR 3.1 Model application files are updated you must remove and reinstall the application.

1. Download the **VECTOR 3.1 Model** from the Fitch Website (see the *Downloading the VECTOR 3.1 Model* section).

2. Double-click **VECTOR 3.x.x** application.

3. Select the Repair to reinstall the application and click **Next**. Follow the onscreen instructions to complete reinstallation.

F. Opening the VECTOR 3.1 Model

To access the VECTOR 3.1 Model you must have downloaded and installed the proper files to you computer. To access an Excel worksheet via the VECTOR 3.1 Model:

1. Select **Start/Program/Fitch Ratings VECTOR 3.1 Model 3.1/VECTOR 3.1 Model**.

2. The Fitch Default VECTOR 3.1 Model application appears in conjunction with Microsoft Excel.

G. Uninstalling the VECTOR 3.1 Model

To uninstall the VECTOR 3.1 Model:

1. Select **Start/Settings/Control Panel**. A Control Panel window appears:

2. Double-click **Add/Remove Programs**. An Add/Remove Programs window appears:

3. Select **VECTOR Model**.

4. Click the **Change/Remove** button. The application uninstalls.

Note: When installing new versions of Vector 3.1, older versions of Vector 3.1 will be overwritten.

Appendix IV: Fitch Industry Mapping

Dow Jones Global Classification Standard		Fitch Industry
ARO	Aerospace	Aerospace & Defence
AUP	Auto Parts	Automobiles
AUT	Automobile Manufacturers	Automobiles
TIR	Tires	Automobiles
BKS	Banks, Ex-Savings & Loans	Banking & Finance
FIS	Diversified Financial	Banking & Finance
INF	Insurance, Full Line	Banking & Finance
INL	Insurance, Life	Banking & Finance
INP	Insurance, Property/Casualty	Banking & Finance
SAL	Savings & Loan Associations	Banking & Finance
SCR	Investment Services	Banking & Finance
ADV	Advertising	Broadcasting/Media/Cable
BRD	Broadcasting	Broadcasting/Media/Cable
PUB	Publishing	Broadcasting/Media/Cable
BLD	Building Materials	Building & Materials
CON	Heavy Construction	Building & Materials
HOM	Home Construction	Building & Materials
ICS	Industrial Services	Business Services
OFF	Office Equipment	Business Services
POL	Pollution Control	Business Services
CHC	Chemicals, Commodity	Chemicals
CHS	Chemicals, Specialty	Chemicals
CPR	Computers	Computers & Electronics
CSE	Consumer Electronics	Computers & Electronics
TSX	Diversified Technology Services	Computers & Electronics
ELQ	Electric Components & Equipment	Computers & Electronics
SEM	Semiconductors	Computers & Electronics
SOF	Software	Computers & Electronics
CSV	Consumer Services	Consumer Products
COS	Cosmetics	Consumer Products
HPD	Household Products, Durable	Consumer Products
HPN	Household Products, Non-Durable	Consumer Products
COA	Coal	Energy
OIL	Oil Companies, Major	Energy
OIS	Oil Companies, Secondary	Energy
OIE	Oil Drilling, Equipment & Services	Energy
PIP	Pipelines	Energy
DST	Distillers & Brewers	Food, Beverage & Tobacco
FOD	Food Products	Food, Beverage & Tobacco
SFT	Soft Drinks	Food, Beverage & Tobacco
TOB	Tobacco	Food, Beverage & Tobacco
PLN	Agriculture	Food, Beverage & Tobacco
CNO	Casinos	Gaming, Leisure & Entertainment
MOV	Entertainment	Gaming, Leisure & Entertainment
REQ	Recreational Products & Services	Gaming, Leisure & Entertainment
MDV	Advanced Medical Devices	Health Care & Pharmaceuticals
BTC	Biotechnology	Health Care & Pharmaceuticals
HEA	Healthcare Providers	Health Care & Pharmaceuticals
MDS	Medical Supplies	Health Care & Pharmaceuticals
DRG	Pharmaceuticals	Health Care & Pharmaceuticals
ITC	Advanced Industrial Equipment	Industrial/Manufacturing
FAC	Factory Equipment	Industrial/Manufacturing
MAC	Heavy Machinery	Industrial/Manufacturing
IDD	Industrial, Diversified	Industrial/Manufacturing
SHP	Shipbuilding	Industrial/Manufacturing
LOD	Lodging	Lodging & Restaurants
RES	Restaurants	Lodging & Restaurants
ALU	Aluminium	Metals & Mining
MNG	Mining	Metals & Mining
ONF	Non-Ferrous Metals	Metals & Mining
PCS	Precious Metals	Metals & Mining
STL	Steel	Metals & Mining
CTR	Containers & Packaging	Packaging & Containers

Dow Jones Global Classification Standard (Continued)		Fitch Industry
FOR	Forest Products	Paper & Forest Products
PAP	Paper Products	Paper & Forest Products
REA	Real Estate	Real Estate
FOT	Footwear	Retail (General)
SAP	Retailers, Apparel	Retail (General)
RTB	Retailers, Broadline	Retail (General)
OTS	Retailers, Specialty	Retail (General)
TMF	Toys	Retail (General)
FDR	Food Retailers & Wholesalers	Supermarkets & Drugstores
RTD	Retailers, Drug-based	Supermarkets & Drugstores
CMT	Communications Technology	Telecommunications
FTS	Fixed Line Communications	Telecommunications
ISV	Internet Services	Telecommunications
CTS	Wireless Communications	Telecommunications
CLO	Clothing/Fabrics	Textiles & Furniture
FTR	Furnishings & Appliances	Textiles & Furniture
AIF	Air Freight	Transportation
AIR	Airlines Index	Transportation
LDT	Land Transportation Equipment	Transportation
MAR	Marine Transport	Transportation
RAI	Railroads	Transportation
TRS	Transportation Services	Transportation
TRK	Trucking	Transportation
ELC	Electric Utilities	Utilities
GAS	Gas Utilities	Utilities
WAT	Water Utilities	Utilities

Copyright © 2004 by Fitch, Inc., Fitch Ratings Ltd. and its subsidiaries. One State Street Plaza, NY, NY 10004.
Telephone: 1-800-753-4824, (212) 908-0500. Fax: (212) 480-4485. Reproduction or retransmission in whole or in part is prohibited except by permission. All rights reserved. All of the information contained herein is based on information obtained from issuers, other obligors, underwriters, and other sources which Fitch believes to be reliable. Fitch does not audit or verify the truth or accuracy of any such information. As a result, the information in this report is provided "as is" without any representation or warranty of any kind. A Fitch rating is an opinion as to the creditworthiness of a security. The rating does not address the risk of loss due to risks other than credit risk, unless such risk is specifically mentioned. Fitch is not engaged in the offer or sale of any security. A report providing a Fitch rating is neither a prospectus nor a substitute for the information assembled, verified and presented to investors by the issuer and its agents in connection with the sale of the securities. Ratings may be changed, suspended, or withdrawn at anytime for any reason in the sole discretion of Fitch. Fitch does not provide investment advice of any sort. Ratings are not a recommendation to buy, sell, or hold any security. Ratings do not comment on the adequacy of market price, the suitability of any security for a particular investor, or the tax-exempt nature or taxability of payments made in respect to any security. Fitch receives fees from issuers, insurers, guarantors, other obligors, and underwriters for rating securities. Such fees generally vary from US$1,000 to US$750,000 (or the applicable currency equivalent) per issue. In certain cases, Fitch will rate all or a number of issues issued by a particular issuer, or insured or guaranteed by a particular insurer or guarantor, for a single annual fee. Such fees are expected to vary from US$10,000 to US$1,500,000 (or the applicable currency equivalent). The assignment, publication, or dissemination of a rating by Fitch shall not constitute a consent by Fitch to use its name as an expert in connection with any registration statement filed under the United States securities laws, the Financial Services and Markets Act of 2000 of Great Britain, or the securities laws of any particular jurisdiction. Due to the relative efficiency of electronic publishing and distribution, Fitch research may be available to electronic subscribers up to three days earlier than to print subscribers.